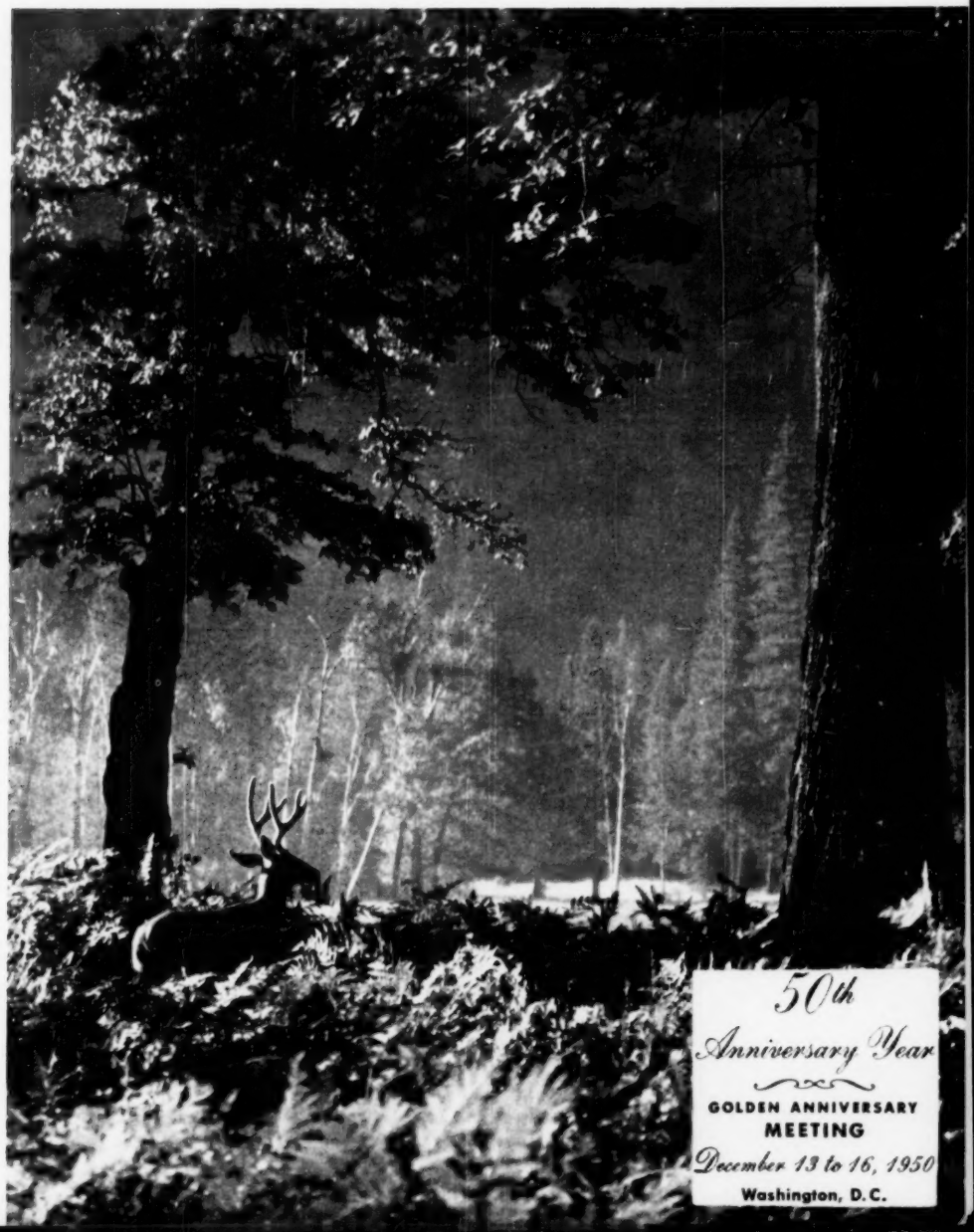
Journal of FORESTRY

OCTOBER 1950



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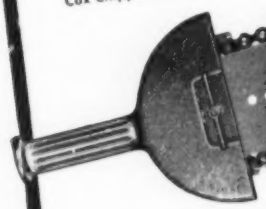

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Forest Service, U. S. Department of Agriculture

"I'm heading for the golden anniversary meeting of the Society of American Foresters to learn more about good forestry."

GOLDEN ANNIVERSARY MEETING

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Journal of Forestry

Official Organ of the Society of American Foresters

The Ecological Approach to Land Management

The economic yardstick now used to determine the best use of land is by no means a safe one from an ecological or biological point of view. Economics has given us strip lands over coal beds and stone fields in rich narrow valleys over gold bearing gravels. Much the same approach gives us barren moss and lichen-covered hills where redwood forests stood; bracken fields where Douglas-fir or cedar and hemlock were produced; great areas of downey chess where bluebunch wheat grass, or Idaho fescue produced a dense cover; snakeweed and burrowweed where valuable gramas covered the soil, and nearly bare soil on our mountains once knee-deep in lush vegetation. The sustained high price of wheat has reduced much of the grass cover of the High Plains to nearly bare soil—a potential dust bowl.

An Editorial

By H. L. Shantz,
Santa Barbara, California.

In some cases plant cover can be reestablished, and depleted soils built back by green manure and fertilizers, but this is usually done only to produce more remunerative crops for greatly increased populations. In the long run, no one can doubt which way soil fertility will go or how much we can hope to meet unlimited population increase with still greater applications of fertilizers and increased yields due to more efficient plants. Certainly we should seek every way possible to utilize efficiently our soil resource, our water resource, and our climatic resource to produce food for man, but we should not lose sight of the fact that there is no limit to the potential increase of population and pressure demand for increased production, but there are definite limits set in our resource of climate, water, and soil.

From an ecological point of view the multiple use program of land use is sound. Ecology should establish the proper balance of priorities of production. This planning should be based on the natural resource of climate, topography, soil, plant cover, animal population, and finally on the needs of the dependent human society. Too often only local and temporary needs are considered. Few lands can be given over to a single crop or to local or temporary needs.

While land can seldom be assigned to a single use there is a tendency for men to manage land with a single purpose approach. The crop man, the stockman, the silviculturist, the wildlife man, the recreationist, and the hydrologist look at land from their point of view, and each group is working to secure as much land devoted to his interest as possible. In public opinion there is a tendency to extend the single use, or sanctuary or refuge system on wild lands and, with the aid of power machinery, to extend the single crop system on agricultural land.

In nature single crops are seldom maintained. The so-called climax communities will in all probability give way after long periods of time to other communities. Douglas-fir in the Northwest gives way after about 2,000 years to cedar and hemlock and there is evidence that cedar and hemlock will break down in a somewhat longer time to alder and maple, if not cut down and the succession thrown back to Douglas-fir.

Ecology is only beginning to take its place in agriculture. In land use it is too often assumed that if a crop can be produced by cultivation that it should have priority over all other uses. Likewise, that if domestic animals can be pastured they have first priority.

The only check to such use of land has been failure or repeated failures. Then too, land management agencies, agricultural colleges, and experiment stations, supported by federal or state funds, are expected to contribute directly to crop or livestock production or wildlife production, but are likely to lose the support of pressure groups if they take on the broader phases of land management.

Everything in nature is linked together and every factor or organism, no matter how feeble, affects some other factors or organisms. It does not follow that factors or organisms are equally effective. The connection between them may be direct and important or very indirect and relatively unimportant. In ecology the concept of the community is an exceedingly broad one and can be grasped in detail only by a method of synthesizing the facts developed by analysis. Synthesis requires an intellect backed by broad training and experience if it is to grasp the significance of the details to the whole.

As a rule in land management the abuses are recognized only after the land has been damaged and the problem has become one of reestablishing normal conditions. Erosion control on grazing land should be accomplished by keeping the plant cover in such condition that erosion is not induced. The composition and condition of the plant cover is a sure indicator of the grazing pressure and of the animal which is responsible for the pressure. It also shows the effects of fire and of a combination of fire, grazing, browsing, and other uses and abuses. The ability to recognize indicators should enable the

land manager to correct the abuses and over-use of the plant cover before the soil is exposed to induce erosion. Ecological perception, the ability to interpret from the composition and condition of the plant cover what has been the past history and to predict with reasonable certainty what will follow if present influences continue is essentially needed by land managers. We should foresee the effects of damaging influences and practices and avoid the practices which cause the gully before the gully is formed. We should see the evidence of overgrazing at its very inception and correct the stocking.

As a rule regional planners have not had a biological background, but have approached the problem from an economic or engineering point of view. Geographers have approached the problem with a broader physical background but as a rule they are weak on the biological side. As an example in land planning the report of the National Resources Board on the High Plains, done largely by engineers and geographers, emphasized the impounding of water whereas nature uses three most important methods: (1) catch water in the soil where it falls, (2) use it as soon as possible for forage production and (3) maintain a plant cover on the soil to prevent soil blowing. It is doubtful if man has ever equalled nature in making such productive and sustained use of a limited rainfall as nature has exemplified on the High Plains. Under natural conditions there were dust storms, but no "dust bowl," and it is doubtful if any grass cover holds the soil so well and resists overgrazing as well as the natural plant cover of short grass.

The unit in land management planning should be the biological community, preferably a plant community, which is so directly correlated with climate and soil that its limits can be definitely fixed. To choose a physical or political unit throws too many ecological units and too many climatic and soil differences together. As an example, if the Pacific Northwest is taken as a unit it would include a great number of ecological units ranging from the sagebrush of the desert to the cedar-hemlock forest. If the cedar-hemlock forest area is taken we have a definite ecological unit for planning. It could easily include the related redwood area of northwestern California. These two areas contain the finest lumber producing forests in the world. However, supported at each step by economic arguments, large portions have already been reduced to relatively inferior agricultural and grazing land. In extreme cases repeated fires to improve grazing have reduced thousands of acres of this land to bracken fern, a perfect fire type, and almost useless. In the redwood section, cutting, repeated fires, seeding, and grazing have reduced the plant cover in places to nitgrass, mosses, and lichens to form the bare hills almost impervious to rainfall and consequently dry and desert-like for much of the year. From a local and temporary economic point of view each step in the process can be justified, but to compare the magnificent stands of redwood with the barren hills and realize that they were once the same, brings one at once to the realization that timber cutting followed by repeated burning and grazing is destroying one of our greatest natural resources, and doing it so effectively that generations can see no hope of undoing the damage. We save a few redwood groves, a worthy effort, but who is to protect the redwood region from slow but nearly sure reduction to relatively unproductive land?

The starved deer herd and the destroyed range on the Kaibab should have saved other herds and ranges from a like fate. I cannot think of a single one that was saved as a result of this example. Each region and each state had to pass through the same devastating experience. "The lives of former generations are a lesson to posterity that a man may review the remarkable events which have happened to others, and be admonished, and may consider the histories of people of preceding ages, and all that has befallen them, and be restrained." These words from the preface of the *Arabian Nights* would seem pertinent, but the lessons of history placed in opposition to an additional pound of beef or a single congressional vote are promptly forgotten.

The story of the decline of natural resources has been repeated in many parts of the world. In Greece the fall of the brilliant civilization may be attributed to the sheep and goats which nourished the mountain population at the expense of the plant cover, the loss of which caused the loss of soil, the silting of rivers, and the development of swamps, which in turn with the aid of malarial mosquitoes reduced the vitality of the Greek people to a point where they were easily conquered. In Italy the story was the same. Goats, sheep, and fire destroyed the plant cover and the soil washed from the rocky hills.

In Spain The Honorable Assembly of the Mesta, the Castillian sheep raisers, controlled church and state for 600 years and established the rights of the pastoral industry over the crop producers. It was responsible for much of the depletion of the forests and other vegetation of Spain. To this same philosophy and movement can be ascribed the replacement of much of the perennial grass cover of our West and Southwest by worthless weeds and the laws which place on the crop producer the responsibility of protecting his land from range livestock.

Unfortunately medieval practices and laws are often such that the land owner finds it difficult to accept a broad ecological point of view in managing his land. Early in our history the feudal lords and the King robbed the commons of their rights to game, even on their own lands. The states have taken over and jealously guarded this right of the King for only he and those licensed by him could take game. The commons or the land owners could prevent the trespass of licensed hunters but otherwise had no equity or rights to manage wildlife on their lands. At the

present time the landowner can protect his land and property by killing the wild animals, but because of a statement used by Henry III of England in the Charta Forista in 1225, "if any man be taken and convicted for taking our venison, he shall make a grievous fine if he (have) anything whereof," only the state (the King) can authorize a man to kill and eat game. Wildlife production on private or federal land is often not an asset to the land owner since he has no right to the animals produced and sustained on his land and no word in the control or harvest of the game crop. Partly as a result of this background there is little adequate wildlife management in the United States and there is not likely to be until the land owner is taken in, at least as an equal partner, in game production and harvest. Game is a product of the land notwithstanding the medieval legal phrases "bona vocantia" and "ferae naturae," on which our game laws are based.

Deer in Relation to Plant Successions[1]

A. Starker Leopold

Museum of Vertebrate Zoology, Berkeley, Calif.

IN 1827 when Jedediah Smith crossed the Great Basin into California, he suffered some lean and hungry weeks traversing areas which now are well stocked with deer (*14*). Smith was a mountain man; he knew game and where to find it. Yet his diary tells us that deer were "tolerable scarce" in parts of the Rockies, the Sierra Nevada and the coastal mountains of Oregon and northern California where today we are managing herds numbering tens of thousands. Elsewhere, however, as around the fringes of the Sacramento Valley, there were plenty of deer. But not in the timbered mountains.

John Work and his Hudson's Bay Company trappers ate horses as they traversed eastern Oregon and the Pit River Valley of northeastern California (*9*). This crossing was made in October and November of 1832. Deer hunting parties vainly searched the foothills and lava rims where now our concern is over-population. Like Smith, Work's party only encountered deer in abundance when they reached the Sacramento Valley proper.

A perusal of early record of the West will show countless similar cases of deer scarcity on what now are our best ranges. Conversely, many of the original deer ranges (e.g., the Sacramento Valley) are now more or less deerless by virtue of agricultural development. This general shift in centers of deer abundance is not solely a phenomenon of the West—it has occurred in many parts of the Midwest and East. The present paper attempts to define the ecological bases which determine shifts of deer abundance and to relate these to current management problems. The following remarks are meant to apply equally to the western mule deer (*Odocoileus hemionus*) and the eastern whitetail (*O. virginianus*).

Historical Changes in Deer Populations

Prior to settlement, deer seem to have occurred principally along "edges" where forest and grassland met or on recent burns in the forest. Neither dense timber nor extensive prairie supported many deer. The woody shrubs and/or tree reproduction which constitute staple items of deer diet are characteristic of *sub-climax ecological conditions* (in other words, of early stages in a forest successional cycle), such as occur even today on prairie borders where woody plants encroach on the grass only to be pushed back periodically by drought or fire. Such edges laced the virgin prairie along watercourses and penetrated the forests on rocky or sandy ridges, south exposures, around wet meadows, and on burns. It was largely in such situations where Smith, Work, and others did find deer in original abundance. Thus, the borders of the Sacramento Valley were maintained in young brush by recurrent fires, some of them probably set by Indians for the specific purpose of producing more game.

Settlement brought profound changes in the original vegetation. Valleys and prairies were cleared for agriculture and the deer habitat destroyed. Much of the eastern deciduous forest and oak-woodland likewise has been converted to farmland. But the dense forest which cloaked so much of North America has been almost universally cut over and burned. The resultant *brush fields and young stands of forest reproduction* are now well stocked with deer. Admittedly, deer range has been created at an exorbitant cost in timber and soil—it represents the ecological release of fertility and biotic energy stored in the soil by eons of forest growth. Conversion of accrued forest fertility into available, nutritive deer forage is principally responsible for the bumper crops of deer which we enjoy today (*8*).

The dictates of good land use preclude indefinite continuance of such wasteful forest practice. We as game managers cannot expect to produce deer much longer on the slashings and burns of the past. Yet it is important in our current thinking that we clearly acknowledge this cause of present deer abundance.

I dwell on the above point, not because it is original or new but because its significance in deer management has not been properly emphasized. Many authors have touched on the importance of sec-

[1] Revised version of a paper presented at the Fifteenth North American Wildlife Conference, San Francisco, Calif., March 8, 1950.

ond-growth to deer, but few have suggested the deliberate maintenance of second-growth for deer. Since this paper was first prepared I have read Grange's *Way to Game Abundance* (*4*) and found therein the clearest statement of the successional problem yet written. Disregarding for the moment the separate question of periodic cycles which Grange associates with successional cycles in the forest, I find my own remarks on the latter subject almost redundant in the light of his excellent discussion. However, the matter can stand repetition.

In addition to providing a greater volume of palatable food, forest clearing may improve the nutritive qualities of browse plants, even those which exist as an understory in the forest. Einarson (*2*) showed a marked superiority in crude protein content of young sprouts in burned areas of coastal Oregon over older growths of the same species occurring in the forest. The vigorous sprouts in the burn supported many more deer and the individual animals were significantly heavier and in better health than those living on unburned range. One could cite considerable additional evidence showing that carrying capacity of deer range is a function of *quality* as well as *quantity* of forage and that both are related directly to successional stages.

Opening up the forest, therefore, has improved it for deer by favoring the growth of nutritive browse. Domestic livestock grazing has accomplished a parallel result on certain climax grasslands.

Western range men are concerned today about the invasion of various xerophytic shrubs in former grasslands following long periods of overgrazing (*10*). Frequently these shrubs are of value to deer, and their spread has permitted deer increases or range extensions into former prairies. On the east slope of the Sierra Nevada for example, such forage plants as sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) have invaded foothills formerly stocked largely with bunchgrasses. These shrubs winter many large deer herds that summer in the adjoining cut-over and burned-over Sierra. It is my impression that similar shrub invasions have occurred widely throughout the Great Basin. To be sure, many of these stands are being severely overbrowsed by both livestock and deer, but their genesis stems none the less in past grazing.

In central and western California, chaparral is spreading into grassland and oak-woodland, due largely, I feel quite certain, to past overgrazing. Shantz (*12*) would ascribe the spread largely to fire, with grazing as merely an accelerating influence. In any event, the extension of chaparral, at least aided and abetted by grazing, is creating deer range where there was none before.

In southern Texas, scrub oak and mesquite have invaded the coastal prairies (*3*) with a consequent influx of deer. Likewise mesquite and other shrubs are increasing on Arizona ranges (*5*). Grazing is probably responsible, either by eliminating grass as competition or as fuel to carry range fires.

To sum up, deer seem to achieve maximum densities in areas of disturbed vegetation which produce palatable shrubs or tree reproduction as secondary stages in plant succession. Logging, fire, and grazing are the three principal influences which in the past have created, or at least improved, most of our present deer ranges. In excess, of course, the same influences can destroy deer range.

Purposeful Control of Plant Successions

The first tenet of deer management in my way of thinking is deliberate manipulation of plant successions to maintain the high carrying capacities of our ranges. We must assume a reduction in indiscriminate slashing, burning, and overgrazing, and plan to substitute in their stead regulated forest and range management which will yield maximum numbers of deer without impairing other wildland uses or permitting soil deterioration.

In forest areas, regulated logging will continue to be important in renewing plant successions. But logging alone cannot be relied upon to maintain uniformly optimum conditions. Over and beyond the present accepted practices of good forestry, we might well adopt such tools of land clearing as controlled burning, chemical plant poisoning or mechanical brush cutting, to stimulate deer food production on critical sites not adapted to timber production. Frequently the *key areas* for deer are not silvicultural sites but marginal fringes of the forest—the lower edges of the yellow pine belt in western mountains, cedar swamps in the Lake States, glades and balds in the Ozarks and Appalachians, sand ridges and swamps in the Southeast. I think we can afford to forego timber production on many such areas in order to grow young brush for deer. Likewise I am convinced it can be done without impairing the forest for watershed protection or general recreation.

Controlled burning is the cheapest tool where applicable. The controlled use of fire has been established practice for years in managing game habitat in the southeastern United States (*13*) and game and livestock range in northern California (*11*, *12*). It is recommended by Grange (*4*) for Wisconsin. Range managers and foresters are beginning to make wide use of fire in the South and Southwest, or at least they are recommending its adoption. Current studies in California seem to show that judicious, rotational burning may be both safe and effective in improving certain chaparral ranges for deer. In short, the fact that fire can be enormously destructive when out of control should not preclude its regulated use in deer management where other forest values are not endangered.

On arid western ranges, the control of livestock grazing is the principal tool at our disposal. Excessive grazing, now so prevalent, has created many deer ranges as mentioned above but it certainly has destroyed others. Moderation in

future range use is imperative to preserve the soil itself, but at the same time some grazing frequently is required to prevent complete reversion to climax bunchgrasses (*1*). I often have heard D. I. Rasmussen say that the quickest way to go out of the deer business in foothills of the Great Basin is to remove all cattle and overstock with deer. Balanced use by deer and livestock is a delicate technique for controlling successions on arid lands.

Paradoxically, fire on such areas often tends to eliminate browse plants and stimulate grass. An area which best illustrates to me the complications of plant succession in western foothills is the Truckee River canyon in eastern California. Along the lower fringe of the yellow pine belt near the town of Boca, logging and recurrent fires have stimulated extensive growths of bitterbrush, on which a fine deer herd now winters. But a few miles down the canyon toward more arid Reno, fires seem to wipe out both bitterbrush and sagebrush, giving rise to almost pure stands of cheat grass. One cannot generalize, therefore, about where and when a given technique may be beneficial. I am sure only that we must think in terms of local plant successions to maintain future productivity of the deer ranges which were created in the past with very little thinking on anyone's part.

Effect of Deer Upon Range

Whereas the carrying capacity of a deer range is primarily a function of plant successions, it may be appreciably altered, for better or for worse, by the deer themselves.

Moderate browsing of shrubs and tree reproduction induces sprouting, thereby increasing the volume of available forage and actually raising the carrying capacity of a range. The palatability of sprouts is higher than that of unbrowsed twigs, and Reynolds and Sampson (*11*) have indicated, at least for *Adenostoma* in California, that the nutritive value is definitely higher —an observation parallel to that of Einarsen previously mentioned. Likewise, the sprouts are within reach of the deer. Their regular pruning prevents the plants from growing out of reach and assures another crop of forage for the next year. In this manner deer can improve their own range up to a certain point.

But when excess numbers of deer occupy a range, they exhaust the vigor of the forage plants by overbrowsing, with consequent reduction in range productivity. The plants may die completely or in the case of taller species simply cease sprouting below the browse line. This phenomenon is so familiar that I scarcely need review it in detail here.

When the volume of forage falls below the requirements of the herd, or when the food is rendered temporarily unavailable by deep snow, mortality ensues—sometimes wholesale starvation, at other times gradual decrease following lowered reproductive success. In warmer climates (such as coastal California or Texas) actual decimation often results from parasitism or disease, but the underlying cause is still inadequate nutrition.

At times excessive numbers of deer consume tree reproduction along with brush species, a fact which may delay formation of a forest canopy or favor reforestation with undesirable species which happen to be unpalatable to deer. This interferes with efficient silvicultural practice. Likewise hungry deer frequently invade agricultural lands and cause extensive damage to crops, orchards, or vineyards.

Many states are now attempting to reduce such excesses of deer. The potential rate of range recovery after deer reduction will vary with the nature and stage of the successional cycle. On the whole, recovery is more rapid on humid ranges, progressively slower and more uncertain on arid ranges. In forest successions recovery may be rapid in the early brush stages, slow or nonexistent as the canopy approaches closure. In all cases, however, overuse of range results in some loss of productivity. Reduction of a population that has been permitted to attain excessive density is at best a salvage operation.

From the foregoing comments, it should be obvious that optimum deer production is not attained by permitting either overstocking or understocking of the range. Regulation of deer numbers to the finely balanced point of *optimum stocking* is the second basic tenet of deer management.

Overpopulations of Deer

The occurrence of overpopulations of deer in the United States was documented by Leopold *et al* (*6*), and the cause of such excesses was ascribed to over-control of two main decimating factors—predation and hunting. I would reiterate that reasoning here. Predators or hunters, or a combination of both, can hold a deer population to the carrying capacity of its range. When both are too closely curtailed, the population is subject to irruption.

Most deer states now recognize the problem of underhunting and are striving to meet it by increasing the kill of both sexes of deer, thereby precluding local irruptions or cutting back herds already irrupted. Much recent progress has been made in this direction.

It is curious that no parallel modification of localized predator control is evolving, either among the states or in the federal government. Predator control is still laid down more or less as a blanket in areas of deer excess as well as areas of deer scarcity, in areas inaccessible to hunters as well as roadside areas where hunting easily can be used to remove excess deer. Often the stated objective is protection of livestock, but in too many cases wholesale control is imposed without real benefit to either livestock or deer. In my opinion the laudable refinements in deer hunting procedures are not being matched by equally judicious modifications of where, when, and how much to reduce deer predators.

As Grange has explained, a deer irruption usually starts in a favorable successional stage and develops in the absence of adequate herd

controls. By eliminating predators we throw the burden of removing surplus animals entirely upon regulated hunting. Where this is actually accomplished, moderate control of predators is certainly justified as a means of augmenting the kill. But where the full harvest is not taken, either by virtue of restrictive regulations or *inaccessibility* of the deer, predator reduction merely complicates the problems of management, hastening the population build-up and the inevitable die-off that follows.

Some would question that predators alone will actually balance a deer herd to its range without depleting it. My best evidence on this point is drawn not from the United States where predator control is nearly universal but from an area in Mexico where the large predators are virtually undisturbed. The drainage basin of the Río Gavilán in northwestern Chihuahua has been maintained in sub-climax vegetation by recurrent lightning fires which stimulate the growth of various deer browse species (*Ceanothus huichagorare*, *Cercocarpus breviflorus*) and perennial bunch grasses as an undergrowth to the oak-yellow pine woodland. On the range white-tailed deer are abundant, and according to residents of the adjoining inhabited valleys their numbers have fluctuated very little in the past fifty years. The population of wolves and mountain lions, existing almost exclusively on deer, is astonishingly high. Unfortunately, no determinations of actual densities were made either in the deer or their predators, but I am certain that the ratio of predators per hundred deer is higher than anywhere in the United States today (7). The high population of deer I interpret as a direct function of good range. The predator level in turn seems to have adjusted itself to the abundance of prey, and without any aid from hunting (which in the past has been very light) the wolves and lions have held the deer population on an even keel without reducing it from its high level.

From this example I would deduce that predators may be a useful tool in balancing herds to range capacities and that at least under some conditions they will do so without unduly reducing the deer. Many of our herds that are inaccessible for hunters might successfully be held in balance by foregoing some of our enthusiasm and vigor in killing off large predators.

Summary

Stripped of qualifying detail, the problems of managing deer may be reduced to the following generalizations:

1. Manipulating plant successions to increase *future* range capacities.

2. At all times balancing the deer to *current* range capacities.

The second of these points is being widely undertaken by adjustments in local hunting laws, aimed at herd regulation. Equally judicious adjustments of local predator control have yet to be accomplished.

Comparatively little thought has gone into the more basic point of regulating plant successions for deer. We cannot continue slashing and burning the forests and overgrazing the ranges—processes which vicariously have produced some of our best deer ranges in the past, though at the same time destroying others. Creation of deer range in the future will have to be deliberately planned as a part of wildland management, with due regard for other values and uses. To me this means not merely "protection" or "moderate use" of the forest or range but purposeful maintenance of young, nutritious brush on key areas for deer.

Literature Cited

1. DYKSTERHUIS, E. J. 1949. Condition and management of range land based on quantitative ecology. Jour. Range Management, 2 (3): 104-115.
2. EINARSEN, A. S. 1946. Crude protein determination of deer food as an applied management technique. Trans. North Amer. Wildlife Conf., 11: 309-312.
3. FISHER, C. E. 1950. The mesquite problem in the Southwest. Jour. Range Management. 3 (1): 60-70.
4. GRANGE, W. B. 1949. The way to game abundance, with an explanation of game cycles. Scribners, N. Y. 365 pp.
5. HUMPHREY, R. R. 1949. Fire as a means of controlling velvet mesquite, burroweed, and cholla on southern Arizona ranges. Jour. Range Management, 2 (4): 175-182.
6. LEOPOLD, A., L. K. SOWLS, and D. L. SPENCER. 1947. A survey of overpopulated deer ranges in the United States. Jour. Wildlife Management, 11 (2): 162-177.
7. LEOPOLD, A. S. 1949. Adiós, Gavilán. Pacific Discovery, 2 (1):4-13.
8. ———. 1949. Ecological aspects of deer production on forest lands. In press, Proc. United Nations Scien. Conf., Conserv. and Utiliz. Resources, Lake Success, N. Y.
9. MALONEY, E. B. 1935. Fur brigade to the Bonaventura: John Work's California expedition, 1832-1833, for the Hudson's Bay Company. Calif. Historical Soc., San Francisco. 112 pp.
10. PARKER, K. W. 1949. Control of noxious range plants in a range management program. Jour. Range Management, 2 (3): 128-132.
11. REYNOLDS, H. G. and A. W. SAMPSON. 1943. Chaparral crown sprouts as browse for deer. Jour. Wildlife Management 7 (1): 119-122.
12. SHANTZ, H. L. 1947. The use of fire as a tool in the management of the brush ranges of California. Calif. Div. Forestry, Sacramento. 156 pp.
13. STODDARD, H. L. 1936. Relation of burning to timber and wildlife. Trans. North Amer. Wildlife Conf., 1:399-403.
14. SULLIVAN, M. S. 1934. The travels of Jedediah Smith: a documentary outline including the journal of the great American pathfinder. Fine Arts Press, Santa Ana, Calif. 195 pp.

Cutting Lodgepole Overstory Releases Ponderosa Pine Reproduction

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THE LODGEPOLE pine forests of central Oregon include many areas with a few scattered large ponderosa pine trees and a fair stocking of very suppressed ponderosa pine reproduction under the lodgepole. Converting such stands to the more valuable ponderosa pine offers an interesting challenge to foresters. Some observers have doubted that the stagnated seedlings and saplings could ever recover and develop properly after such long and severe suppression. However, removing the lodgepole overstory on a test plot on the Pringle Falls Experimental Forest has shown that seedlings do grow well after release and that conversion is feasible. The test has also pointed up some of the possible dangers and difficulties in such treatments.

A 1-acre experimental plot was completely cleared of lodgepole pine by Civilian Conservation Corps labor in 1934. The lodgepole stand averaged about 75 years old and contained 821 trees 1 inch d.b.h. and larger, with a basal area of 79 square feet and a volume of 2,100 cubic feet, or about 26 cords. Average age of the 2,464 suppressed ponderosa pine seedlings and saplings on the acre was about 40 years; their average height was 1.7 feet and the largest tree was 12.5 feet. Measurements of ponderosa seedling heights on 25 sample quadrats were made in 1934, 1940, 1943, and 1947. Current leader growth was measured on the surviving seedlings each year after 1941. A 1-acre check plot for similar measurements was established in the adjoining uncut stand in 1937.

Ponderosa pine reproduction on the cleared plot had developed well by 1948 (Fig. 1). The average height of all surviving released seedlings on the quadrats increased to 5.5 feet (Table 1), and the tallest tree was 15 feet, while on the check plot average height reached only 2.8 feet. Annual height growth since 1941 has averaged about four times as rapid on the released seedlings as on the unreleased ones. About 10 percent of this superior growth is due to the difference in initial height of released and unreleased seedlings which survived through 1947. Appreciably faster rates of growth are being made by the better free-growing trees (Table 1); some, of sapling size, show leader growth of more than one foot per year. The difference in apparent thrift and vigor of the seedlings is striking. Most of those under the lodgepole overstory are still crooked little whips with a tuft of pale needles on the tip, while many released seedlings have become sturdy, erect saplings with heavy, bushy crowns and strong leaders.

FIG. 1.—*Above:* Plot 20 on the Pringle Falls Experimental Forest, just after cutting of the lodgepole pine overstory in 1934. The large ponderosa pine trees in background are not on the plot. *Below:* the same view in 1948, showing vigorous growth of the formerly suppressed ponderosa pine seedlings.

The released seedlings did not respond immediately after cutting; for 6 to 8 years their growth rate was not much greater than that of the check seedlings. This was noted by length of leaders after the check plot was established. The cause of this delay is not known. The time may represent either a "shock period" due to sudden exposure or the period required to build up the root and leaf systems to take advantage of the increased growing space. It is probable that recovery was also delayed by the dry cycle of the 1930's, for the check trees also showed an improved growth rate beginning about 1942.

Many of the released seedlings on the clear-cut plot have died, but the loss of seedlings on the check plot has been very light. On the cleared plot only 16 percent of the number tallied in 1934 were alive in 1948; on the check plot 90 percent of those recorded in 1937 were still living. (Precise comparison cannot be made because no tally was made on the check plot in 1934, nor on the cut plot in 1937.) Relatively few new seedlings have established themselves since 1934 on either plot. A similar but somewhat brighter picture is shown by the figures on percentage of milacre quadrats stocked by ponderosa pine:

	Quadrats stocked
	Percent
Clear-cut plot	
1934	88
1948	46
Under lodgepole overstory	
1937	60
1948	72

On the cleared area, lodgepole seedlings overlooked in clearing or seeded-in after 1934 brought the total stocking in 1948 up to 62 percent; on the check area total stocking was 97 percent.

Causes of loss on the cleared plot have not been tallied in detail, but many seedling deaths have resulted from gnawing by porcupines, mice, and probably other rodents, and

TABLE 1.—HEIGHT AND INCREMENT IN HEIGHT OF RELEASED AND UNRELEASED PONDEROSA PINE SEEDLINGS WHICH SURVIVED THROUGH 1947

Year	Released seedlings	Unreleased seedlings	Selected released seedlings	Selected unreleased seedlings
	Average total height—feet			
1934	3.3		4.3	
1937		2.2		3.4
1940	3.6	2.4	5.0	3.7
1943	4.3	2.6	6.0	3.9
1947	5.5	2.8	8.0	4.4
	Average annual increment in height—feet			
1941	.18	.04	.28	.07
1942	.23	.05	.34	.09
1943	.28	.05	.42	.09
1944	.29	.08	.45	.13
1945	.32	.08	.53	.12
1946	.35	.08	.58	.13
1947	.33	.08	.52	.13
Basis—No. of trees	82	87	29	22

from rubbing by deer. Small openings in an uncut forest often receive a greater concentration of animals and damage than do extensive openings. Rodents and deer may also be largely responsible for the shortage of new reproduction. There has been abundant opportunity for seeding-in, for the opening is surrounded by both lodgepole and ponderosa pine seed-bearing trees. As the saplings are now well established and growing to a size class in which killing is much less likely, future losses should not be serious. Although stocking is not as uniform and complete as desired, the present stand presents a good general appearance and seems capable of forming a nearly normal stand before the time it is merchantable.

The study has demonstrated two things:

1.—Ponderosa pine reproduction, severely suppressed for 40 years or more by an overstory of lodgepole pine, will recover and grow well on certain sites after clear-cutting of the lodgepole.

2.—Substantial loss in number of seedlings may occur but would probably be less on larger areas than on this small one.

We can conclude that conversion is possible by release where reproduction is present and where the soil type and site will produce ponderosa pine. But there are sites where ponderosa cannot compete with lodgepole.[1] For example, level lying soils having an underlying hardpan which helps retain soil moisture in the root zone support a dense stand of lodgepole pine to the exclusion of the less aggressive ponderosa. Where the soil moisture situation is somewhat more critical, either lodgepole or ponderosa pine will grow. In extremely critical soil moisture situations the lodgepole drops out of competition. Such soil-tree relationships must be known before a sound estimate of the desirability of converting mixed stands to ponderosa pine can be made.

Success in converting to ponderosa pine would be more certain and rapid if the heavy seedling losses could be avoided and the so-called shock period reduced. This might be accomplished by successive partial cuts over a much larger area at a time or by a shelterwood cut followed by a later clear-cut to remove the lodgepole. A test of such methods is planned.

Clear-cutting has not been the general practice because many lodgepole stands contain several age classes and many small unmerchantable trees. Most commercial lodgepole cuttings in this type on the Deschutes Plateau of central Oregon have been moderate partial cuts for crossties, posts, and other miscellaneous products. Few of these cuttings have stimulated ponderosa reproduction. Recently the use of lodgepole pine poles and sawlogs has increased, and prospects are good for an expanding pulpwood use. Better markets should make possible heavier cuts and more intensive control in management—the measures that seem necessary to promote conversion. However, heavier cuts will require special care to protect the seedlings from destruction by logging and slash disposal. Careful logging has resulted in fair survival of advance reproduction in mature ponderosa pine stands, but such care may be more difficult in the relatively dense lodgepole stands.

It should not be concluded that complete conversion of all these mixed stands to ponderosa pine is desirable or practicable. In spite of all reasonable efforts to favor ponderosa pine, sites that are well adapted to either species will reproduce in part to the more aggressive lodgepole pine through at least another rotation, perhaps indefinitely. Also, having some lodgepole in a ponderosa pine stand is not necessarily bad. In some places lodgepole pine may well be grown as a supplementary crop to be harvested at perhaps half the rotation age for ponderosa pine. The production capacity of lodgepole pine should not be underrated; normal cubic-foot yields on these sites nearly equal those of ponderosa pine, and even the unmanaged check plot in this study shows a mean annual increment of about 40 cubic feet per acre. For sawlog production, however, ponderosa pine is superior, and economical means of favoring it such as are suggested by this study should not be overlooked.

[1] Tarrant, Robert F. Forest soil survey gives significant results. Pac. N.W. For. and Range Exp. Sta. Research Note No. 36, October 15, 1947.

Forestry in Denmark

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THE PURPOSE of my trip to Denmark was to become acquainted with changes in silvicultural concepts and forest management practices which had taken place during the past two decades. The visits, therefore, included the Forest Experiment Station, the Forest Genetics Station, and several forests known for specific types of management[2].

Denmark has an area of about 18,000 square miles. Some 8 percent of this, or less than a million acres, is forest, two-thirds of which is privately owned. About 57 percent of the forest is coniferous. The forest area has doubled since 1805 as a result of (1) the planting of the heathland, and (2) forest legislation. The most important legislation is the Act of September 27, 1805, which states that "where there is now high forest there must always be high forest." The act prohibits clearcutting in all private holdings, unless regeneration is assured. In newly purchased areas it forbids the cutting of wood for sale during the first 10 years following purchase, unless the operation is approved by the government.

The private owners soon learned that only through skillful management could they afford to keep their forest land. For many years now the forests have been the pride of their owners, who have learned that forestry is a profitable business.

Under the leadership first of A. Opperman, and now the present director C. H. Bornebusch, the Forest Experiment Station has contributed immensely to the high standards of forest management in Denmark and has to a high degree influenced silviculture in Northern Europe. Formal experimental forests, as such, do not exist, inasmuch as most of the Danish forest districts are experimental forests in a sense. Practically all the forests cooperate in the various phases of experimental work, and most of the Experiment Station projects are requested by the practicing foresters. The research personnel plan and supervise the establishments of the experiments. Technical assistance and labor for establishment and remeasurements are usually supplied by the cooperating forests, whether public or private. The Experiment Station works up the data and publishes the results, often in cooperation with the district foresters.

Work to be undertaken by the Experiment Station is subject to approval of an advisory council consisting of seven public and private forest managers and forest owners, elected from the Danish Forest Society. They meet annually with the director and personnel of the Experiment Station to discuss problems and to help formulate the program. Current suggestions and other questions are handled by correspondence.

Optimum Stocking Realized

The question as to what constitute optimum stockings in managed forests seems to be solved, particularly for oak, beech, and spruce. It is found that through intensive management, which leaves the best trees for growing stock, the optimum stocking is considerably less than formerly specified, ranging from 90 to 120 square feet of basal area per acre on average sites, depending upon the tolerance of the species. Growth and yield by optimum stock levels on different sites have been worked out and presented in tables now in use by most foresters for management and marking guides.

To the visitor one of the most striking things is the work accomplished in tree improvement, through breeding and particularly through parent tree selection for seed and vegetative propagation. Many of the results of this work are being put into practice to an increasing extent on private as well as public holdings. The foresters in the field agree that with the comparatively small acreage of forest land they can afford to grow nothing but the very best, both in regard to quality and growth. As a result, natural regeneration has been replaced largely by planting stock of known, superior origin. Striking examples of hereditary differences in form and growth are to be seen in many districts, and the foresters speak with confidence of the virtues inherited from selected parent stock. Eventually, as new stands of superior strains mature, the foresters hope to go back to natural regeneration.

Regeneration Not Left to Chance

Most of this work has resulted from the tireless efforts of C. Syrach-Larsen, in charge of the State Arboretum, to demonstrate to his fellow foresters the importance of heredity and the consequent upgrading through proper selection of good strains. Development of superior planting stock through seed selection, hybridization, and vegetative propagation is being done on a commercial scale. Twigs and buds are being grafted on young planting stock as well as on individual stems in well established plantations. In the latter case the grafting is done by cutting the trees about 3 feet above the ground when the plantation has reached a height of 6 to 8 feet. By that time the root systems are well developed and capable of supporting the fast growing grafting materials from selected parent trees. The grafted trees, which are spaced at regular intervals in the plantation, soon overtake the rest of the plantation and constitute future crop trees.

The Langeso forest district is a private forest on the fertile island of Fuen. This forest is known for its well managed stands of exotic

[1] At present assigned to Economic Cooperation Administration, Korea.

[2] The author wishes to express his appreciation to Professor S. O. Heiberg of Syracuse for pointing out and contacting the several districts, and to the many Danish foresters who cordially guided him and supplied information.

species, particularly American West Coast conifers. The more important species are Douglas-fir, Sitka spruce, white fir, grand fir, western redcedar, western larch, Port-Orfordcedar, and western hemlock. I did not obtain growth figures for the different species, but was informed that they surpass the native species to various extents. The intense management and excellent quality of these species, was refreshing to see. The periods between cutting vary from one year in the young stands to three years in the older stands.

Supervisor O. Marstrand Jorgensen of this district is particularly interested in mechanization of the various phases of forestry and made a trip to the United States shortly after the war to study the latest developments here. At the time I visited the district, planting was in progress. A small, powerful, self-propelled soil pulverizer was used for ground preparation. The machine is of English manufacture and operates on the principle of a rotary-tiller. It cultivates a strip about 20 inches wide and 5 inches deep and is operated by one man in the same manner as a power lawnmower. After the top soil has been pulverized by the machine the center of the strip is cut to a depth of about 10 inches by means of a horse-drawn subsoil plow. This method has the advantage over furrowing that the soil is kept in place, and yet it is loosened to the full depth of the plant roots for very efficient planting and continued good growth. Later I saw the same machine as standard equipment in all other districts.

Throughout conversations with several foresters in Denmark I was given the impression that the cost of planting stock is almost immaterial as long as they get the best for their money, namely, fast growing strains and good form. The planting stock, therefore, is culled very heavily. Costs of planting stock vary from $10 per thousand for home grown stock, to $50 per thousand for special certified stock. The foresters stressed that they cannot afford to prepare the ground, plant the stock, and care for the plantation by anything less than the best methods known, for they cannot afford to sacrifice growth. It is the initial establishment and growth that determines the degree of success. Since the spacing is close, 4 by 4 feet for conifers and 3 by 4 feet for hardwoods, the total plantation costs run from $50 to $150 per acre, depending upon the stock used. This includes fencing and plantation care.

The Frijsenborg forest, near Aarhus on the eastern part of the peninsula of Jutland, is one of the largest forests in Denmark. Two-thirds of this forest consists of conifers and one-third of hardwoods. The conifers are Norway and Sitka spruce, European and west American firs, European, Japanese and western American larch, and western hemlock. The hardwoods are European beech and oaks. According to supervisor H. H. Bülmann, the conifers are by far the best investment. Hardwoods are maintained for two reasons, however—primarily as a "backbone" for the less wind-resistant conifers, and secondly, because of market demands. The management of this forest has long been classed among the most intensive and progressive in northern Europe. Forest research has been thriving here for 40 years or more, both independently and in cooperation with the experiment station.

Management is Intensive

The forest as a whole is managed on a good deal less of growing stock than are most of the publicly managed forests. The yields, however, are enormous. As an example, one stand of larch, which was planted in 1923, was cut for the first time in 1936. Seven cuts between 1936 and 1947 yielded a total of 3,860 cubic feet per acre. The present growing stock is 103 square feet of basal area per acre, and the average height is 57 feet. As an example of the intensive management, I was informed that the forest employs one year-round man per 86 acres. All the planting is done under natural shelter, and most of the older stands, therefore, are two-storied. In many cases a temporary understory is planted primarily as a soil protector. Upon regeneration with permanent species, the temporary understory is thinned out and used as a nurse crop.

Besides protecting the soil the understory yields good income from the annual cutting of decoration greens, thus adding considerably to the total income from the stands. The price received for most greens is about 4 cents per pound. For certain species, such as noble fir, the price runs up to 15 cents. The annual yield of greens on this forest varies from 150,000 to 200,000 pounds, thus providing a substantial part of the income. I was informed that after deducting current expenditures including wages, planting, cultural work, and roads, but not taxes, the net annual income of the forest is 8 percent of the forest capital.

Overgaard is a private estate located along the south shore of Hadsund fiord in eastern Jutland. Its present owner, F. Juncker, is one of the most aggressive foresters in Denmark. His basic theory is, in short, that trees are destined to grow to a certain diameter, but that certain trees of any one species will reach this diameter at a much earlier age than others, due to heredity and physiological differences within the species. On the other hand, the trees which grow slower in their youth will reach the same diameter in time, provided they are always given proper growing space. These latter trees develop smaller branches and better form and are, therefore, the better suited for final crop trees. The management system under this theory results primarily in cutting "from above," continually removing "sprinters" which threaten to outgrow and interfere with the development of the moderate growers. Practitioners of this theory stress that the system requires even more skill than the most skillful application of standard silvicultural practices

in order to prevent high-grading.

The younger stands on Overgaard are cut every year, removing 80 percent of the growth until the stands reach a maximum of about 80 square feet of basal area per acre, sometime before mid-age. From then on all the annual growth is cut by removing trees whose average diameter is about one-half inch more than the average diameter of the stand. The present rule of thumb on most districts is to cut both from "above" and "below" in such a way that the average diameter of the cut is equal to the average diameter of the stand. The orthodox method of cutting from "below" and from the sides to an average diameter of one-half inch less than the average diameter of the stand is still used in some of the more conservative districts. The most important point in Danish thinnings is that they are not restricted to any particular system, but emphasize throughout the life of a stand an evaluation of the present condition and the future prospect of every tree. The thinnings, therefore, are made at very short intervals. Among the intensely managed stands at Overgaard was a stand of Norway spruce planted in 1921. It has been cut every year since 1938. The average annual diameter growth is .35 inch. Since the stand has now reached 80 square feet of basal area per acre, the entire annual growth is being removed annually, constituting at present 280 cubic feet per acre. Mr. Juneker emphasized particularly that in forest management the question is not how long or how short the rotation should be, but rather, how long can a stand be maintained and still produce satisfactory interest.

The Korselitze State Forest is one of the best hardwood districts in Denmark. It is located on the east side of the fertile island of Flaster, in the southernmost part of Denmark. The site classes for beech are I and II, and the beech here reaches its optimum development. Supervisor Chr. Smith emphasized that the growing stock on this forest is being held at a maximum, and that the cuts at present, therefore, are among the more conservative in the country. The primary purpose of management is to grow the highest grade hardwood products. As on most Danish forest properties, the management compartments are very small (10 to 20 acres). The management is based on very short cutting cycles of 2 to 3 years. Each tree on the entire compartment is calipered prior to marking in order to determine the actual growth. In this manner the allowable cut is predetermined each year. When the allowable cut has been determined the trees are marked for cutting. The marked trees are calipered and the volume determined progressively. The local tree measurement volume tables are checked frequently with the actual scaled volumes, and they are therefore very accurate. Last year the allowable cut was 5,660 cubic meters (198,880 cubic feet). The different compartments were marked and the volume progressively determined by calipers. The actual scaled volume of the cut products came to 5,662 cubic meters (198,950 cubic feet). Mr. Smith now feels that his local tree measurement tables are about as close as may be expected.

The Bregentved forests, which have been managed by forest inspector Th. Jagd for many years, are privately owned. They are located in the eastern part of the Island of Zealand and cover about 7,400 acres. The average size of a ranger district in Denmark is about 1,200 acres, so that Bregentved has six rangers and numerous other year-round personnel. From 1918 to 1928 the forest was cut very heavily in order to eliminate a large amount of accumulated old growth, and at present, the forest consists of what is considered a disproportionately high percentage of young stands, still in the process of building up. The annual average allowable cut is 80 percent of the growth.

This forest is known particularly for the management of oak. At the age of 50 years the final crop trees are selected and permanently marked with paint. During future cuttings special attention is given to the crop trees in order to develop full crowns which, at the time when only 25 trees are left per acre, will have an average spread of 45 feet and thus still form a closed stand. A closer examination of a 60-year-old stand proved that the average crop tree diameter was 15.8 inches and the present average diameter growth .36 inch.

Bregentved is a typical shelterwood forest. Practically all but the very youngest stands are two-storied. The understory may be of the same species, obtained through management, or it may be obtained through planting of other species. The primary purpose of the understory is to protect the soil and the lower part of the overstory trees—to "keep their feet warm," as Mr. Jagd expressed it. In this connection a study is now under way to determine (1) if and to what extent the different understory species and densities affect the growth of the overstory, and (2) to what extent the understory growth outbalances the possible growth loss in the overstory and adds to the total yield. The study involves several acres of each of several species.

As in most Danish forests, at Bregentved several exotic species are being planted in the regeneration of coniferous areas. One of the most impressive of such areas is that of grand fir, now 22 years old. In order to save planting stock it was originally planted with a mixture of 50 percent Norway spruce at a spacing of 4 by 4 feet. The spruce now has been removed in partial cuttings, as have many of the firs. The present average diameter of the stand is better than 8 inches, and the current annual growth is 540 cubic feet per acre of saleable materials. In addition to incomes from the wood harvested, this 40-acre stand to date has yielded about $1,500 in decorating greens.

The compulsory heavy war and postwar demands resulted in very heavy cutting of forest products in Denmark. While this has definitely reduced the total wood capital, it has not, however, reduced the annual growth to any appreciable extent. The foresters "swept the corners" of their forests, taking out only what was considered nonessential trees. This has left the forests in good condition with only the best for growing stock. Recent FAO observations rated Denmark as a strong number one, both in regard to forestry practices and growth.

Forestry in Denmark consists of individual tree management of horticultural intensity and may rightfully be considered forest gardening. The foresters are keenly interested in the forestry program and progress in America, particularly in regard to research and utilization.

A visit to these intensively managed forests is a refreshing experience, but particularly refreshing is the sincere enthusiasm displayed by the practicing foresters for the future of forestry.

Sampling Yields and Utilization of Browse on Winter Deer Ranges in Northern Idaho[1]

The dry weight yields of current growth from browse plants on rectangular plots of twenty different sizes were tested statistically to determine the relative plot efficiency for sampling winter browse in cut-over western white pine forests. Use and availability of browse species were studied concurrently.

The site of the yield sampling study was an upland Douglas-fir forest type commonly used by white-tailed deer (*Odocoileus virginianus macrourus*) during the winter. Different sample units were obtained by combining yields from subdivisions of a major plot which was 6 feet wide and 48 feet long. The basic subdivisions were 1, 2, and 3 feet wide and 8 feet long. Current growth was clipped to a height of 6 feet and was not separated as to species for the purposes of evaluating relative plot efficiency.

Consideration was given the calculated variance per unit area of forage weights and the number of samples required for a certain level of accuracy in deciding which plots were most efficient. Plots of two sizes provided the most information. One was 1 foot wide and 8 feet long. It was indicated that seventy-seven of that size would be required to obtain an accuracy of 20 percent at the 95 percent probability level. Forty-one of the other size, which was 2 feet wide and 16 feet long, would be required for the same level of accuracy. The heterogeneity suggested by the numbers of required samples appeared to be a characteristic of the type sampled, however, it was considered impractical to break it into sub-types.

Of the total forage weight 67 percent was snowberry (*Symphoricarpos albus*), 18 percent was baldhip rose (*Rosa gymnocarpa*), and 7 percent was serviceberry (*Amelanchier florida*). In terms of length of current twig growth 92 percent of snowberry and 80 percent of rose was produced below 3 feet. Those two species and others with similar limits of height growth were generally unavailable during the first 3 months of 1950 because of the snow which was approximately 3 feet deep.

Winter use was determined by use of the twig measurement method and by snow trailing. Serviceberry and willow (*Salix* spp.) provided most of the available browse forage and received the greatest use.

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[1] Abstract of Master's thesis; 1950.

Postwar Developments in Forest Products Research[1]

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PROBABLY the people responsible for technical progress in all industries are prone to underestimate the advances that have been made, and for the most part see only the things that should be done. Therefore, this paper may unintentionally present the gloomy side of the picture as it exists in the wood products industry. If this is so, I wish to apologize to the many progressive firms that are using trained technical personnel and are engaging in research on a par with other industries both in quality and quantity.

A compilation of the researches taken by the progressive lumber and wood products manufacturers, if it could be accurately undertaken, would be of extreme interest and value. It would encourage the less progressive firms to do something for themselves, and it would also encourage engineering and forest utilization schools to turn out men specifically trained for the jobs which must be undertaken.

Historical Traditions

Volumes have been written about the type of research and quantity of research that is needed by the wood industry. But most of these writings fail to get at the core of the problem and, even though they give us valuable information as to what should be done, they do not tell us how it can be done.

The chief reason for lack of progress in modernizing the wood industry is that trained men have not filtered into the industry in sufficient number.

Small manufacturing units when prevalent in an industry are apt to restrain technical progress. This is not meant as a criticism of our present system. The small units have served their purpose in the past, are doing a magnificent job today, and will continue to serve as long as trees grow.

Since much of the lumber industry is and must be made up of widely scattered small units, we must recognize that the job of modernizing is more difficult than where industries are compact and comprised of a few large concerns such as the steel industry or the chemical industry. In these compact industries technical progress has been very rapid. Compactness and wealth of an industry are of course only two of the influencing factors; another is extreme necessity.

For many purposes wood is so easily worked that a reasonable use has been possible without developing highly technical processes. This will always be true. The wood industry may lose many of its present markets, but it will never lose them all, and it will always be a favored raw material. It has its faults as all other raw materials have, but one of its big advantages is that it can be used by relatively unskilled people whereas such materials as metals and chemicals must to a great extent be developed and fabricated by technically trained personnel. Research in these other industries has, therefore, been a necessity. They could not have obtained a foothold without technical progress. The strength of the lumber industry in the past is in some respects its present weakness.

In order to obtain technical progress, it is necessary that administrators and executives in the lumber and wood products industry be technical people themselves. This does not mean that we cannot have technical progress without college trained men. Many of our finest scientists and our best executives have never had the benefit of a formal training, but in some way or other they have trained themselves. A formal technical education is always helpful.

Therefore, the first necessity is that highly trained men to a very large extent take over the administration of the forest products industries. Nothing that management or technical schools can do will change this. However, there are ways to hasten the procedure.

Technical Training

If our technical schools train men properly with full knowledge of the problems of the industry, these men can filter into the production plants in positions which at the moment are not of the executive type, but which will provide the trainees with that necessary practical experience in production which they cannot learn in school.

Nontechnical executives often do not understand the barest fundamentals of technical progress. For example, I know of plants where haphazard methods for determining moisture content of lumber are still used. A few years ago when training kiln operators for a large lumber concern, I found that it was usual for the moisture content to be determined by boring a hole in the side of a board. If the sawdust which came out of the hole smelled wet and had the general appearance of having a high moisture content, it was determined that the lumber was not dry enough to use. Even today the personnel of many companies are not trained in the use of moisture meters and do not know how valuable these inexpensive and easily operated instruments can be.

A situation such as this seems inexcusable, but it exists because management does not always understand the problems of technical advancement.

Profits from Trained Personnel

Thoroughly trained technicians should be brought into the lumber industry in such a way that their training will immediately show a profit. There are many places where this can be done. For example, we need trained kiln operators to take the place of the untrained ones. Technically trained

[1]Presented at a meeting of the Wood Industries Division, American Society of Mechanical Engineers, Washington, D. C., April 14, 1950.

personnel will not be satisfied with the present methods. They will develop new processes and they will improve the old ones.

In operations where glue is used, technical personnel can revolutionize the present systems. It is a long cry from the old fashioned glues that could be handled easily for general purpose jobs to the new types of specialized glues which require for their proper use an understanding of chemistry and of the technology of wood. Many wood fabricating plants are trying to do a job with unskilled personnel. So far, it has been relatively successful but as time goes on such plants will have to forego the use of many new modern glues.

The methods for finishing furniture are little different than they were twenty-five years ago. Here we have chemical processes, but the industry is trying to conduct a chemical operation without chemists. Highly trained men for this purpose are needed.

In the manufacture of lumber and the machining of wood, advancement has been due almost entirely to the development of improved metals for machine tools. We have done nothing to help the metallurgist, much less to improve our methods of using the new metals. Lumber is planed today the same as it was thirty years ago. We saw about the same way, with the same general type of saws. We have added a few ball bearings to the machines which reduce power consumption and permit higher speeds, but the industry can be on the threshold of a revolution in machining if it will employ technically trained personnel.

Electronic Investigations

To a small extent the wood industry has used electronic devices, but the credit for developing these devices and for the use of them is not that of the wood industry. It has probably resisted, rather than assisted, the electronic equipment manufacturers in developing machines for its use.

High frequency gluing has become widespread, but there are many other jobs that electronics can do. For example, we need to investigate drying and treating methods. We can probably use electronics to help us stabilize lumber against shrinking and swelling. We can use electronic equipment to detect metals in wood, to determine its density, and perhaps to improve machine jobs.

We need new methods for quality control. Many products now being made by the industry could be tested by electronic devices to determine whether each piece for a critical item has the necessary strength. For example, parts for wood ladders are all strength members and, if weakened by unknown defects, may cause injury or death to the user. Airplane parts, scaffolding and staging material, and many other products require a higher order of quality control than we have so far developed.

Economic Studies

Most industries familiar with research, before undertaking the production of a new item, make an intelligent economic survey to determine the size of the potential markets. In contrast, when the lumber industry sets out to develop or sell a new product it often takes a chance. Sometimes it hits the jack pot. Usually it does not. This type of haphazard market development has created resistance by management to venturing into new fields. However, it can be expected that, as time goes on and experience is gained, young men suitably trained for economic surveys will be employed to handle the situation. This type of work not only requires a technical education but a thorough understanding of the problems of the wood industry.

Need for Improved Products

The industry needs to design new products and redesign many of the older ones. For example, much lumber goes into the construction of boats. Wood boats, other than those made of plywood, are almost identical to those which were produced a hundred years ago. Newer materials are coming on the market. Boats are being built with them. It is claimed they will not leak when dried by the sun nor will they be attacked by shipworms. All materials have certain weaknesses. These newer ones are no exception. But that is no reason why the wood boat industry should sit on its heels to wait for something to happen. It should immediately start to improve its own products.

Forty years ago all desks and other office equipment were of wood. Today only 50 percent of the desks manufactured and less than 7 percent of the filing cabinets are of wood. This is not because wood does not make good office furniture. In fact, wood is usually preferred by executives for their own use. It has certain properties that make it desirable and most comfortable. Partly because we have not improved designs, we are losing the markets for the less expensive products.

Many chairs, such as the folding variety and out-door chairs, are now being made of steel. We need new designs so that wood chairs will give better and cheaper service. These are only a few of the things where technical design is needed by the industry and where many highly trained men can be used.

Modernizing Production

Even in our sawmills and other production plants we need intelligent thought and planning to redesign our production lines. Often they are so antiquated that the cost in raw material and labor is more than double what it should be. Some years ago I worked with a manufacturer of hardwood flooring. By redesigning the production line the waste in raw material was reduced 50 percent, the market value of the product was doubled, and production costs were reduced.

In cooperation with design engineers we need efficiency engineers. For a fee efficiency companies will go onto a job and make recommendations that may be helpful. But the industry needs its own efficiency engineers, men who are trained in this particular field, probably by the company itself.

Regardless of improvement in machining equipment or the skill

of the manufacturer in reducing waste, the machining of lumber will always produce quantities of wood waste. Chemists, chemical engineers, mechanical engineers, plastic chemists, and others should be assigned to utilize the raw material which is now being wastefully used for fuel or, worse still, is being burned without recovering even the heat value of the wood.

Our Wood Products

From the foregoing one may infer that our present wood products are not soundly designed or properly sold, or that the physical structure of our industry is entirely wrong. Such is not the case. If it were so, our mills would not be producing large quantities of lumber. Production today is on a reasonably satisfactory basis. Probably no other material can provide the economic housing which we have known in America or the fine furniture which is universally used. The problem is not whether our products and materials are good, but whether we can make them better. One way of making them better is to use them in combination with other materials to reduce cost and provide improved quality.

For example, the composite type of automobile body which was superseded by the all-steel body only a few years ago was probably superior in strength to its successor and much superior to the early all-wood body. The loss of the market was due almost entirely to economic factors.

Today most of the large truck bodies and the special service types are of composite construction. We can probably hold these markets, especially if we proceed along technical lines, such as using new laminating procedures.

The wood station wagon body is rapidly giving way to steel because it was not economical to produce and was unsatisfactory in service. In this case a modest sum spent in technical developments to improve durability would probably have saved the market.

That we have lost many other markets because of lack of technical improvements in design and low cost manufacture can be quickly ascertained by looking into the windows of sporting goods shops, automobile sales rooms, and furniture stores. A few illustrations will serve to emphasize the point as follows: automobile bodies, picture moldings, wood flooring, office furniture, candy sucker sticks, boats, containers, airplanes, instrument cases, wood blocks and pulleys, gun stocks, folding chairs, and home cabinets. In the foregoing list some of the items deserve further mention. Picture moldings, for example, have to a very large extent gone to synthetic or molded type products. It is not hard to understand why this is so. Perhaps it is not a large market but it is worthwhile maintaining. We have lost many markets formerly held by wood flooring. Asphalt tile can be produced very cheaply and has been able to compete in many types of buildings.

The lowly stick for the all day sucker is only a small use for wood but illustrates a point. It seems impossible but true that sucker sticks can be made of wound paper cheaper than from the wood dowels. Fiber containers, because of skillful technical progress and millions of dollars worth of research, have made huge inroads into the market which was formerly controlled almost entirely by wood.

The finest television and radio instruments are advertised as having wood cabinets. However, for the highly profitable low cost market plastic cases have taken over the field. The production of wood cabinets is too expensive.

Many of the cheaper sporting rifles are now equipped with plastic stocks. In appearance they resemble wood but the principal virtue is low cost.

Holding Our Markets

We can't save every market through technical research and the employment of technical personnel, but we can hold many of them and for those which we lose we can gain replacements.

In the field of wood research many men could be beneficially employed to develop systems for stablizing wood against shrinking and swelling. There is probably no technical problem facing the industry of more importance than this one. If we learn to stabilize wood economically, we can provide much better finishes. We can build stronger structures. By stabilizing it we can prevent the shrinking and swelling of drawers and the sticking of doors.

Paints and Finishes

We have fairly reliable house paints that can be depended upon for years of service. Perhaps they can be improved and should be, but for many other products our present finishes are woefully lacking. For example, finishes have been developed for the metal surfaces of automobiles that will endure years of outdoor service but we can't use these finishes on wood nor can we expect the durability of any known wood finish to equal that on the automobile or the porcelain refrigerator. This need not be so. Perhaps overlays of plastic such as fiber glass or other materials can be used to overcome these difficulties.

However, we have made some improvements in finishes. For example, it is now possible to purchase furniture that has cigarette-proof tops. We have perfected hardened furniture legs so that the wood desk, for example, is much better than it was several years ago. But the improvements which we have today have been possible only because the industry has technicians who are working in a virgin field.

Many markets have been lost to the lumber industry because we have not developed new product designs that lend themselves to mass production. We have difficulty in competing with steel stampings or plastic moldings; they may not look as good as wood or be as durable, but they are cheaper and serve the purpose. A complete list of the loss of markets because of antique design would be very long.

Wood Research

A few facts and figures with respect to research may be interesting. Unfortunately, it is impos-

sible to provide a dollar basis for consideration, but perhaps we can get at it in some other way.

According to the best information, 12,500 wood research projects have been completed or are being currently undertaken. Of this total, 45.2 percent has been in the chemical and chemical products field; 15.6 percent in processes, materials, and devices used with wood in order to improve or modify its properties and use; 11.3 percent in the field of primary timber and lumber products; 8.7 percent has been devoted to structure, identification, and properties of wood; 10.7 percent to fabricated wood products; 6 percent to building, building parts, and other structures; and 2.5 percent to means and devices for the selection of wood.

Conducting wood research in the United States are 118 colleges and universities, 97 federal and state organizations, 238 manufacturers of forest products, 868 processors, consumers and materials suppliers, 201 professional societies and commercial laboratories, and 98 trade associations. Some of the projects are large, some are small, and the foregoing figures of course give no indication as to the dollar value of the research in the various subdivisions mentioned.

Needed Research

The American Society of Mechanical Engineers is interested in the type of research projects which should be undertaken immediately. Therefore, the following list of projects is submitted, not necessarily in the order of importance:

1. Surveys to determine quantity, location, and form of waste wood. Also surveys to determine the economics of various researches now under way. For example, what are the potential U. S. markets for hardboard, feeding yeast, molasses, fertilizers, etc.? What influence has freight rates on the use of wood for such purposes?

2. A more comprehensive compilation of all known research in wood. *The Forest Products Research Guide* published by the Committee on Products and Research of the National Lumber Manufacturers Association is a beginning. It tells where research is being done, but not how much or the value of it. There is no complete bibliography on research.

3. Research coordination is needed, not only to prevent unnecessary duplication but to prevent the loss of valuable research data. During the war the government and private industry conducted hundreds of uncoordinated projects. The value of much of this work will be lost because there is no complete centralized recording of these data. For example, a review committee working under the direction of the Munitions Board surveyed all government specifications for articles where wood is used. These data which required thousands of hours to prepare now seem to have been lost.

4. Research to develop processes for stabilizing wood to resist shrinking and swelling. Both fundamental and applied research are necessary.

5. Research in lignin.

6. Elimination of defective material from low grade lumber at the source of production rather than in the fabricator's plant.

7. Improvements in drying and pressing equipment for hardboards from wood waste.

8. Improved design for woodworking equipment.

9. New fast adhesives, particularly of the waterproof variety, and simple inexpensive equipment for obtaining required clamping pressures, especially for curved members.

10. Inexpensive (portable and permanent) equipment for debarking small logs, slabs, and other sawmill and woods waste.

The National Lumber Manufacturers Association has long been engaged in certain phases of research. Until 1941 this type of work was confined to market surveys, statistical studies, etc. It did not engage in the so-called laboratory type of research. However, it was realized by the directors that in order to do a reasonable overall job in the field that a laboratory would be necessary.

The Timber Engineering Company which is affiliated with the National Lumber Manufacturers Association is the organization that undertook the development and marketing of timber connectors. The work accomplished by this company is probably outstanding in technical development in the lumber industry, but the Timber Enginering Company has since gone much further by constructing and operating a technical laboratory on the outskirts of Washington.

The number of employees at the laboratory is not great but in the past six years it has developed from a two-man organization to its present position where it now has 22 persons on the laboratory staff. It has engaged in several hundred projects, most of which have been applied research, but some fundamental research is being conducted.

Scholarships

At its last annual meeting the directors of the National Lumber Manufacturers Association made a fund of $1600 available in 1950 for scholarships from the forestry schools in the country. These awards have now been given to four graduate students from four different universities. Each successful candidate will be given $400 for his expenses and will be brought to the Teco laboratory for the three summer months of 1950 where he will be trained in industry problems.

Out of the 28 eligible forestry schools to enter this competition, students from 20 schools submitted applications. Through these means we not only intend to help four young men of outstanding ability to obtain positions that will count but we also intend to use whatever influence we have to help the other 16 men acquire similar positions.

Training Courses

In addition, short courses are being conducted at the laboratory.

One of the great difficulties in the use of modern glues in furniture plants, dimension plants, etc., is the inability and inexperience of

most of the firms to do testing. In order to overcome this condition the Timber Engineering Company developed low cost testing equipment which could be afforded by even the smallest concerns. In order to obtain widespread use of the equipment, short courses in gluing have been given at the laboratory once each month for the past half year. From six to eight students from industry have been accommodated at each course. It is believed that through this means we are able to assist the industry to make technical progress.

It is also believed that firms who send men to these courses will be convinced that trained personnel are necessary. Hence we believe the activity will result in the employment of more engineers and other technicians.

Schools will be conducted at the laboratory to assist hardwood manufacturers to cut up and package remanufactured low grade lumber so that it can be shipped and used more economically.

Much of the research work at the Timber Engineering Company laboratory has been for the manufacturing concerns of the lumber industry. Large programs wherein groups get together to finance research are under way. Progress has been made in developing new products, but one of the greatest difficulties has been to get them into use. This difficulty is being slowly overcome, but the results of research will not gain the desired momentum until we have more trained technical personnel in the industry to apply research results.

The work at the Teco laboratory is not confined to lumber manufacturers. Furniture manufacturers, adhesive manufacturers, or any other concerns or individuals interested in manufacturing wood products or products used with wood can bring their problems to us to be solved. In fact, many of them have already done so. We believe that this work is accomplishing much to further the technical ability of the wood products industry and the employment of technical personnel.

Observations on the Growth of Red Spruce In Sand Culture[1]

Gordon M. Day and W. Rei Robbins

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A preliminary nutritional study of red spruce yielded results which indicate the growth potential of this species is not generally realized.

RED SPRUCE, *Picea rubens* Sargent, has long been the principal source of raw material for the sulphite pulp and paper industry in northeastern United States. Although existing natural stands are of great importance in the Northeast, cutting has frequently converted spruce-hardwood mixtures to hardwoods (8). Red spruce seedlings occur abundantly in the flat and slope phases of the red spruce type, but when artificial reproduction is used, the faster growing white spruce or the still faster growing Norway spruce is generally chosen. In fact, there is so little interest in the planting of red spruce that it is difficult to obtain seed from dealers or planting stock from nurseries.

This disregard has been caused undoubtedly by the slower growth rate of red spruce in the nursery and on the planting site (6). If this slow growth rate could be overcome, it would seem to be a better risk to reproduce red spruce in the region where it is naturally dominant than to plant the rarer white spruce or the exotic Norway spruce. Nutritional studies, therefore, are in order for two reasons: (1) to find a treatment which will increase the growth rate of red spruce in the nursery, and (2) to provide a basis for silvicultural practices which will accelerate the growth rate of red spruce in the field.

The experiment reported below was undertaken to determine the response of red spruce seedlings to complete nutrient solutions with varied nitrogen levels.

Methods

The seed used had been collected in 1938 in Essex County, N. Y., in the eastern Adirondacks and, after extraction from the cone, kept in a sealed bottle in cold storage.[2] In 1939, germination tests showed 78 percent viability.

Seeds were sown on March 12, 1947, and germinated in a flat or open box containing white quartz sand 4 inches in depth, the particle sizes of which were similar to those of a good concrete construction sand. The box was kept in a greenhouse with a temperature of approximately 70 to 80 degrees F during the day and 60 degrees F during the night. The box and sand were sterilized in an autoclave in flowing steam for 30 minutes to destroy damping-off fungi and were allowed to cool before planting. A total of 73 seeds were planted in rows about ¼-inch deep and ½- to ¾-inch apart in the rows. The box was covered with a sheet of glass and placed under a greenhouse bench in the shade. The sand was kept moist by additions of distilled water as needed. Care must be taken to prevent leaching when distilled water is used. If dilute nutrient solutions are used, such care is not necessary. Two weeks after

[1] Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University—the state university of New Jersey, departments of forestry and plant physiology.

[2] Seed was obtained through the cooperation of E. J. Eliason of the New York State Conservation Department.

TABLE 1.—NUTRIENT SOLUTIONS[1] USED DURING FIRST GROWING SEASON

			Solution No. 1							
Salt	KH_2PO_4	$Ca(NO_3)_2$	$MgSO_4$	K_2SO_4						
Molar conc.	.0005	.0025	.001	.001						
Element	K	Ca	Mg	P	N	S	Fe	Zn	Mn	B
P.p.m.	97.8	100	24	15.5	70	64	½	¼	¼	¼
			Solution No. 2							
Salt	KH_2PO_4	$Ca(NO_3)_2$	$MgSO_4$	K_2SO_4	$(NH_4)_2SO_4$					
Molar conc.	.0005	.0025	.001	.001	.001					
Element	K	Ca	Mg	P	N	S	Fe	Zn	Mn	B
P.p.m.	97.8	100	24	15.5	98	96	½	¼	¼	¼

[1]The trace elements Fe, Zn, and Mn were supplied as ferrous, zinc, and manganous sulphates respectively and boron as boric acid.

sowing, several seeds had germinated and the glass cover was partially removed. About a month after sowing, when practically all the seeds had germinated, the glass cover was completely removed, and the box was so placed as to receive full morning and afternoon sunlight but noon shade. Six weeks after seed sowing, all seeds had germinated, and the seedlings were placed in full sunlight for the remainder of the experiment.

On the sixteenth day after sowing, 44 seedlings had appeared, and distilled water applications were replaced by a daily flushing with a dilute nutrient solution (Solution 1, Table 1). Because experience with the nutrient culture of this species appeared to be completely lacking, this solution was tentatively chosen on the basis of the nutrient culture of other species in this laboratory.

After 2 months of this treatment, the new foliage growth appeared a little chlorotic. Accordingly, Solution 2, containing additional nitrogen in the form of $(NH_4)_2\ SO_4$, was substituted for Solution 1 in order to lower the pH of the nutrient solution in contact with the roots during nutrient absorption, thereby keeping a greater concentration of available iron in solution.

Five months after seed sowing, three seedlings were transplanted into each of five 9-inch glazed pots containing washed white quartz sand similar to that used for seed germination. The remaining seedlings were reset and allowed to remain in the germination box. Solution 2 was supplied to all cultures in order to determine whether any ill effects of transplanting would appear, and in order that the seedlings might become uniformly established before the varying nitrogen treatments were begun.

After 10 days of treatment with Solution 2, each pot was supplied with a different solution providing 7, 14, 56, 112, and 336 p.p.m. of nitrogen, all as ammonium ion. These solutions are not described because, within 20 days after starting these latter treatments, all seedlings had become dormant, and the growth taking place during this 20-day period was negligible.

Observations and Results

Seed germination followed much the same course which Heit and Eliason (*2*) found for this species. It took place more slowly, however, because the criterion of germination here was the appearance of the shoot above the surface of the sand, whereas Heit and Eliason germinated the seeds on blotters and used the definite appearance of the radicle through the testa as the criterion. No new seedlings appeared after the forty-third day following sowing. The percent germination was 78, exactly the same germination percent obtained for this lot of seed in 1938 (*1*).

By the eleventh day after beginning treatment with Solution 2, the lower, older leaves had turned dark green. It may have been that this color change was in part an accompaniment of leaf maturation and not entirely due to the change in nutrient treatment. By this time, a clear differentiation in seedling height was evident; this was certainly due in part to differences in germination time which covered a span of 33 days.

By July 21, 41 seedlings had reached a height of 3 to 4 inches and displayed leaves of a deep green color. The leaves were also glaucous, an appearance which the authors had never seen on red spruce. Sixteen seedlings had not broken the terminal bud formed near the base of the cotyledons early in the spring, and the ends of the cotyledons had become brown. Three of these retarded seedlings resumed normal growth the following spring, and the others appeared to be still alive.

After transplanting, two seedlings in the pots and five in the box wilted and died in spite of the fact that they were carefully washed from the sand during transplanting. Probably wilting and death occurred because most of the very small absorbing surfaces of the roots at this stage were at the tips of the lateral short roots and were easily stripped. Sample root systems, examined under the microscope at different stages, appeared to have neither root hairs nor ectotrophic mycorrhizae but only non-mycorrhizal short roots, completely suberized except for the extreme tips. This is the usual condition of coniferous roots in nutrient sand cultures (*5*). The ends of the long roots were unsuberized 2 to 5 mm. from the tips.

Ten days after beginning treatment with varied levels of ammonium nitrogen, buds began to form, and within another 10 days all seedlings were dormant. It is doubtful whether nutrient treatment was responsible for the onset of dormancy, because it occurred simultaneously between September 4 and 6 in the potted seedlings and in the seedlings still receiving Solution 2 in the germination box. Various attempts to break dormancy failed, but growth was resumed spontaneously by most seedlings, without regard to previous treatment, between January 26 and February 18. Dormancy was resumed between March 15 and 24.

The heights of the seedlings in the pots at the end of the first growing period are shown in Table 2.

During the winter growth peri-

TABLE 2.—SEEDLING HEIGHTS ATTAINED IN ONE GROWING SEASON BEGINNING MARCH 28

N Treatment	Seedling number	Height, August 25	Height, Sept. 4
		Inches	*Inches*
Very low[1]	1	5.4	5.5
	2	5.3	5.6
	3	4.8	5.1
Low	1	5.9	6.0
	2	5.0	5.2
	3	4.3	4.3 (dead)
Medium	1	5.9	5.9
	2	5.2	5.4
	3	4.4	5.4
High	1	5.3	5.4
	2	5.3	5.4
	3	5.4	5.4
Very high	1	6.1	6.3 (dead)
	2	5.0	5.0
	3	4.6	4.7

[1]Very low, etc., represents the different levels of nitrogen used for the last 10 days of the growing season. Most of the growth in height was made during treatment with Solutions 1 and 2.

od, about half of the seedlings exhibited active lateral buds and dormant terminal buds on the terminal shoot and some of the branches. The result was plants with abnormally long branches and without the conical habit of young conifers grown in the open. Browning of the first season's needles was fairly common.

Discussion and Conclusions

Although this experiment was of a preliminary nature, it yielded some taxonomic information and a number of results which will be helpful in future sand culture work with red spruce.

1.—The color of red spruce leaves—long used as a diagnostic feature by taxonomists and variously described as yellow-green, deep green, or simply non-glaucous—is seen to depend on nutrition and to be an imperfect criterion for species identification. Leaf color still retains most of its practical value for identification, however, because glaucous leaves are seldom if ever found on red spruce in the field, perhaps as a consequence of the usual fertility status of spruce soils.

2.—This experiment suggests that the conventional nursery practice of giving half-shade to spruce seedlings throughout the first summer may be unnecessary and may be retarding the first year's growth in well-fertilized and well-watered nursery soils.

3.—Although the suitability of nitrate nitrogen *per se* remains untested, the use of a nitrate salt as the only source of nitrogen in sand culture apparently raised the pH of the nutrient solution in contact with roots, reduced the concentration of available iron in solution, and prevented the seedlings from achieving their normal color. The use of a nutrient solution in which one-third or more of the nitrogen is in the form of an ammonium salt usually permits more satisfactory iron absorption then when nitrate is the sole source of nitrogen.

4.—The transplanting of seedlings even by carefully washing them out of a sand substratum, may do serious damage to the non-mycorrhizal root system in which the absorbing surface is confined to the extreme ends of the short roots. Thus, for experimental purposes, it cannot be presumed that a transplanted seedling is equivalent to an untransplanted seedling or to other transplants of the same size.

5.—For about two months after the majority of the seeds had germinated and for one month after the last had germinated, a nutrient solution was used which contained 70 p.p.m. of nitrogen, all as calcium nitrate. The solution used during the next three months contained 98 p.p.m. of nitrogen, two-thirds as calcium nitrate, and one-third as ammonium sulphate. At the end of this period, the seedlings had attained heights of 4 to 6 inches. These heights are about three times as great as those of 1-year-old red spruce seedlings growing in the field and about equal to the heights of 2-1 transplants, both under Southern Appalachian conditions.

Heights of 3 to 4 inches were achieved by the seedlings in sand culture at the end of a period corresponding to the length of growing season in the northern part of the natural range of red spruce. Norway spruce seedlings require 2 years in nursery seed beds to reach these heights, and Meyer (*4*) found that red spruce in the Northeast averaged 6.9 years to reach a height of 1 foot in full sunlight. It is possible that the well-known deficiency of available nitrogen in mor humus—the characteristic humus type for red spruce stands—is responsible for the reputation of red spruce as a slow grower.

6.—Greenhouse culture of red spruce seedlings during the winter is unsatisfactory because of the unpredictable occurrence and length of dormant periods and of the frequently abnormal seedling form caused by the growth of lateral

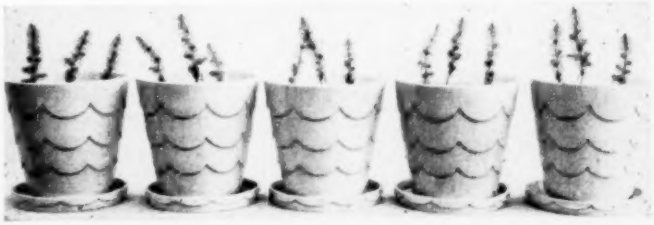

FIG. 1—Red spruce seedlings after 4 months on nutrient solutions.

buds while the terminal buds are dormant. It appears desirable to adopt Hesselman's technique (3) which employed a glass-roofed shelter with open sides, permitting plants to assume and maintain their normal dormant period.

7.—The fact that the retarded seedlings were able to survive at least one summer in the dormant state on the food furnished by the seed and manufactured by the cotyledons may give some clue to the ability of natural reproduction to survive on the forest floor for extended periods. In the forest, of course, seedlings may be killed by natural enemies such as insects or disease.

8.—Growing red spruce in sand with nutrient solutions has certain uses. In nature, however, this species almost invariably displays a root system which is completely invested with ectotrophic mycorrhizae. This habit makes difficult the application of quantitative results obtained from non-mycorrhizal seedlings grown in sand culture to the growth of most seedlings in the field. The interpretation of nitrogen nutrition in particular is difficult. In sand culture, nitrogen is obtained from nitrate or ammonium salts or both, with consequent problems of pH drift and iron and other trace element availability. In an ordinary forest soil, available nitrogen occurs in small amounts, principally as ammonium nitrogen produced during the decomposition, largely by fungi, of complex, resistant organic matter. Changes in the pH value of the soil solution caused by nitrogen absorption are relatively small because of the presence of buffers. The ammonia nitrogen is absorbed by the haustoria of the fungal components of the mycorrhizae, which use it for their own nutrition as well as for that of the spruce. In what form or in what proportions it becomes available to the spruce from the fungus is not clear.

A further complication in the study of tree nutrition is presented by the ability of most tree species to form mycorrhizae with more than one species, or even genus, of fungus, frequently unknown, which it is reasonable to expect have different procurative abilities, nutritive requirements, and metabolic products. These products may be the sole source of nitrogen nutrition for the tree under ordinary forest conditions (7). Results obtained from sand culture should, however, be applicable to nursery-grown seedlings without mycorrhizae.

Bibliography

1. ELIASON, E. J. 1947. Private communication to authors dated February 27, 1947.
2. HEIT, C. E. and E. J. ELIASON. 1940. Coniferous tree seed testing and factors affecting germination and seed quality. N. Y. Agric. Expt. Sta. Tech. Bull. 225.
3. HESSELMAN, H. 1927. Studier över barrträdsplantans untreckling i råhumus. I. Betydelsen av krävemobiliseringen i råhumustäcket för tall- och granplantans första utveckling. (German resume). Medd. fran Statens Skogsförsöksanstalt 23: 337-432.
4. MEYER, W. H. 1929. Yields of second growth spruce and fir in the Northeast. U. S. Dept. Agric. Tech. Bull. 142.
5. MITCHELL, H. L. 1934. Pot culture tests of forest soil fertility. Black Rock Forest Bull. 5.
6. MURPHY, L. S. 1917. The red spruce; its growth and management. U. S. Dept. Agric. Bull. 544.
7. WAKSMAN, S. A. 1932. Principles of soil microbiology. Williams and Wilkins.
8. WESTVELD, M. 1931. Reproduction on pulpwood lands in the Northeast. U. S. Dept. Agric. Tech. Bull. 223.

Fifty Years of Forestry in the U. S. A.

Edited by Robert K. Winters, chairman of the Society's Committee on History of Forestry, the book, *Fifty Years of Forestry, in the U. S. A.*, will be available in time for sales at the Golden Anniversary Meeting, or earlier.

Nineteen authors, each chosen for his knowledge of the particular field, have contributed chapters on the first half century, forest protection, silviculture, forest management, forest utilization, range management, forest wildlife management, forest influences, the U. S. Forest Service, the U. S. Department of the Interior, other federal agencies, state forestry, industrial forestry, farm forestry, the Society of American Foresters, citizen and trade associations dealing with forestry, education in professional forestry, forest research, and American and world forestry.

Stereotypes for Aerial Photo Interpreters

Edward F. Steigerwaldt
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In the past few years much progress has been made in the use of aerial photographs in forestry, and many new ideas to aid the photo interpreter have arisen. The author presents an explanation of his stereotype cards which are designed to correlate the aerial view with the ground view and plot data and have the material available in a practical form for a photo interpreter.

ONE OF THE most valuable uses the forester can make of aerial photography is in timber type mapping. Their value in delineating forest type boundaries and condition classes, while viewed stereoscopically, has been realized for many years. The man responsible for the timber typing, the photo intrepreter, draws on many things to aid him in making as detailed and accurate a type map as he possibly can. The size, shape, and shadows of trees, and relationship of trees to the surrounding terrain are his biggest aids. Personal knowledge of the area being mapped is also very helpful.

Photo interpreters realize there exists a need for aids that will tie-in the interpretation to something tangible and help reduce some of the "interpretation" in photo type mapping. The stereotype cards do just that. They are cards on which a vertical aerial stereopair is mounted alongside a ground stereopair of the same type, and correlated with sample plot data taken in the stand. The use of stereopairs or stereograms mounted on paper or cardboard with helpful notations or plot data is not new, for many federal and state agencies as well as private organizations use them to a great extent. Spurr[1] has developed a stereogram record card for use at the Harvard Forest. It too contains a vertical stereopair and data collected on a sample plot and was found to be most helpful for instructional and research purposes. However, it is felt a new aid in the form of the ground stereopairs is worthy of explanation.

Mounting Card

The basis of the stereotype is a piece of 5- by 8-inch cardboard on which is mounted a black and white reproduction of a form originally drawn and lettered on tracing cloth (Fig. 1). Before mounting on the cardboard, the paper form is run through the typewriter so that the necessary information and plot data can be typed. Kodak dry mounting tissue and a hot press do a fine job of mounting the form to the card and the photos to the form. Rubber cement would also work well. A standard printed form made at a print shop could also be used. The flight strip and photo numbers of the stereopairs are inked on the back of the card for future reference.

[1]Spurr, Stephen H. Aerial photographs in forestry. Pp. 176-179. The Ronald Press Co., New York. 1948.

Sec ____ T ____ N., R ____ W

____ County

Plot ____ Date ____ 19____

Species	Trees/Acre		Reproduction		Net VOLUME/Acre	
	LS	SS	Pole	2"	4"	Cords	Bd Ft
1							
2							
3							
4							
5							
6							
7							
8							
Total							

AVERAGE

Stand Ht ____

Merch Ht ____

D B H ____

C D ____

Infra Red Film (Y Filter)

SCALE 1:15,840

Fig. 1.—Printed form used for mounting stereotypes.

Stereopairs

The vertical stereopair is an inch square and at the scale of 4 inches to a mile, the scale of the photos used in Wisconsin Conservation Department inventory surveys, it represents 40 acres. They are cut from glossy prints and always from areas outside the boundaries to be mapped. There are normally a quantity of extra prints on the beginning and end of each flight strip that serves admirably for this purpose; but they may not always yield the range of possible types desired.

A hinged acetate or transparent paper overlay is pasted over the left stereopair; the outline of the type is made in black, and the type colored green. When viewed with the stereoscope the flap is merely folded back out of the way. Since it was not possible to reproduce the card with the overlay and still view it stereoscopically, the overlay was removed and the type outlined with white ink on the left stereopair. A ¼-acre circular plot in red ink is placed on the overlay in as nearly the exact position that the plot was taken on the ground. By chaining or pacing from an object identifiable on the photo the exact plot center can often be pinpointed. At 1:15,840 a ¼-acre plot has a .0399-inch radius, and with care it can be placed neatly on the overlay with a drop center pen.

Plot Taking

In choosing the plot location it was necesary to pick an average area representative of the whole type. Due to lack of time in preparing these stereotypes, it was necessary to limit the plots to one. Naturally, if more plots could be taken throughout the stand a bet-

ter average figure could be obtained. Pacing to the plot center from an object discernable on the photos was followed whenever possible so an accurate pin pointing of the center could be made on the vertical overlay. A small hand axe was driven into the tree which became the plot center. Since the plots were taken alone, a hooked screw in the plot center tree came in handy as the "other man" to hold the end of the measuring tape when the perimeter of the plot was taped off. A standard ⅕-acre cumulative tally sheet was used to collect the data for merchantable volume, and also a 1/50-acre plot for a reproduction count. Tallied trees were marked with chalk so no duplication would result. In addition some average figures for the total stand height, merchantable height, stand d.b.h., and crown diameter were taken. The data on the cards could be enlarged to include such information as cull percent in poles and sawtimber, soil type, basal area, site quality, etc. However, for the primary purpose of type mapping it was felt that the data presented on the cards was sufficient for use by the photo interpreter. Additional information can be obtained when necessary from notes on the tally sheet which are kept on file.

Ground Stereopairs

To take a ground stereopair requires a camera that gives a 100-percent stereo coverage on a contact print and allows the prints to be mounted side by side and still be the average person's interpupillary distance. Any twin lens reflex camera that takes a square 2¼ by 2¼-inch photo was found to fulfill these requirements. My particular camera, an Automatic Rolleiflex with an f 3.5 Zeiss Tessar lens, made an excellent camera for use on the ground stereo views. Stereopairs are taken from two photos of the same object from a slightly different camera position. After some experimentation with different camera center intervals it was found that 6 inches was a good spacing. Figure 2 shows the set up necessary to take stereo ground views. A simple wood platform

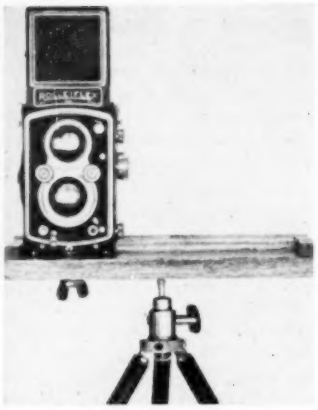


FIG. 2.—Camera and tripod set up used to take ground stereo views.

with a slot down the center that allows the camera to be shifted six inches and a threaded well on the bottom for the tripod head, completes the equipment. A reliable light meter is a worthy addition to assure good photos.

Hyperfocal Distance Tables

To get the photos of stands in perfect focus requires the use of a table of hyperfocal distances for the camera lens. It assures 100 percent focus from the front of the photo to infinity. Any photo store can supply a photo text on the subject that will allow the preparation of such a table for the lens of the camera to be used. Often the camera manufacturers have such tables already prepared and will mail them upon request. The table can be pasted or taped on the inside flap of the camera case where it is always handy. To make use of the table a light meter reading is taken of the type to be photographed. Then by referring to the figure in the hyperfocal distance table opposite the f stop the meter indicates for your exposure, hyperfocal distance is found. This means that by focusing the camera at the hyperfocal distance, everything from one-half the hyperfocal distance to infinity will be in focus. Table 1 shows the hyperfocal distance table for the lens of the f 3.5 Zeiss Tessar lens. If, for example, in a dense stand of jack pine an f stop of 22 is indicated by the meter, all the trees from 7 feet to infinity should be in sharp focus. If there are a few trees between 7 feet and the camera which would be blurred if photographed, simply moving the camera position a few feet either way may eliminate the potential blurring. Or you could choose a different f stop and shutter speed that would result in a shorter hyperfocal distance and allow you to move the camera forward to a position that would have no trees near it to become blurred.

TABLE 1.—HYPERFOCAL DISTANCE TABLE FOR 4 THREE INCH ZEISS TESSAR LENS. BASED ON A 1/1200 CIRCLE OF DIFFUSION

f stop	*Feet*
22	13.7
16	18.8
11	27.3
8	37.5
6.3	47.6
5.6	54.5
4.5	66.6
3.5	85.8

When taking the stereopair it is a good idea to have some item of clothing or field equipment in the stereopair that would serve to compare the trees' dimensions with that particular object. A hand axe was found to be a very good object for this purpose. A tatum holder, hat, or field bag would be equally as effective.

A word of caution regarding light conditions when photographing timber types—a bright shiny day is a poor day to take pictures of forest stands as the large number of shadows tends to distort and confuse the picture. Slightly hazy days are ideal and allow a clear view through the stand.

Taking the Ground Stereopair

The camera should be placed on the left side of the board and fastened to a good tripod. After the light meter reading has been taken and the hyperfocal distance table referred to, the camera should be focused. Compose on the center of the plot, click the shutter. Move the camera over to the right 6 inches, and take another picture, without moving the tripod of course. A narrow wood guide on the back and sides of the camera board assures perfect alignment for each photo. The films are developed in the normal manner and a

FIG. 3.—Ground stereopair taken in a stand of large-toothed aspen averaging 20 cords per acre. Burnett County, Wis., 1949. Note the detail available when the photo is taken on a hazy day.

glossy contact print made of each. Numbering the negatives in the order in which they were taken will facilitate assembling stereopairs. The completed stereopairs mounted side by side will give a good three dimension view through the stand as shown in Figure 3.

Use in Photo Interpretation

Any photo interpreter will be quick to appreciate the value of having a card index of the possible timber types found in the area being typed (Fig. 4). With the typing classification recommended by the Lakes States Experiment Station,[2] there is a possibility of having 15-20 condition classes for each species, as well as a number of non-forest land types. It is quite evident that having a complete file of stereotype cards at hand before an area is type mapped from the photos, would certainly give the photo interpreter an excellent tool with which to do his interpretation. By comparing doubtful types on the photos with the stereotypes he knows are correct, he can quickly narrow down his choice of the map type and be more nearly correct in his interpretation than he could be before.

In stands of even-aged and pure types, such stereotypes would be very effective in typing the area correctly. Mixed types and two-storied stands still remain a strict interpretation problem but with stereotypes of representative mixed types on hand the problem could be made a little easier.

Use in Training

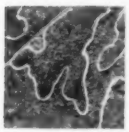
The training of new photo interpreters in forest type mapping is normally a lengthy job, requiring long hours of study in the office and familiarization in the field. With the stereotypes the pertinent data are at the trainees' fingertips, even so far as to bring the outdoors indoors in the form of the ground stereopairs. Training time can be very materially reduced. Another advantage is that the stereotypes

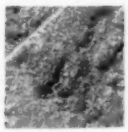
[2] Choat, Grover A. Aerial photographs—an efficient tool in management plan surveys. Jour. Forestry 47:961-965, 1949.

SENW A 5-11'

Sec 21 T 47 N, R 11 W

Douglas County





Plot 19 Date January 31 1950

Species	Trees/Acre			Reproduction		Net VOLUME/Acre	
	LS	SS	Pole	2"	4"	Cords	Bd Ft
1 Aspen, q.			155		500	4.7	
2							
3							
4							
5							
6							
7							
8							
Total			155		500	4.7	

AVERAGE

Stand Ht 50'

Merch. Ht. 16'

D B H 6"

C D 6-8'

Infra Red Film (Y. Filter)

SCALE 1:15,840

FIG. 4.—A completed stereotype card with the vertical aerial photos and ground stereopairs mounted in their proper position.

put more emphasis on developing the interpreter's skill in judging height and crown density by constant comparison and repetition. This lessens the need for intensive training in the use of parallax wedges and other height finding aids.

Limitations

It is obvious that the vertical stereopairs will not appear the same unless variations in paper, tonal contrast, time of day, and season of photography can be kept similar. Since a county of average size can be flown adequately in a day or two it is possible to make up stereopairs from the aerial photos and have them appear fairly uniform in tonal contrast and shadow lengths. For an area larger than a county it would be necessary to check carefully so that the stereopairs are taken from photos having the same time interval of photography, month, and similar contrast paper. If this were not done there would be large variations in tone and shadow lengths that would reduce the comparative value of the completed stereotype cards.

The cost of making up such stereotype cards is not too great, but is a factor that will have to be considered. With the camera mentioned you can get six sets of ground stereotypes for the cost of one roll of pan 120 film (42 cents), plus developing and contact prints of each for 85 cents, or a total of $1.27 for each roll taken. The forms can be made at a local printing shop for about 5 cents each. Plot taking was done during the normal course of survey duties, and no cost figures are available. Vertical aerial stereopairs were cut out of areas outside the forest management area and did not affect the use of the photographs for their normal survey needs. It is possible for one interpreter to cut out, mount, and label between 20 and 25 stereotype cards a day. All things considered, I believe an average cost of 75 cents per stereotype card would come close to the actual figure.

The value of such a permanent set of references for the photo interpreters would certainly be worth the investment, especially, if a forest inventory of any size is being considered.

Fire Protection Law Enforcement Trends in California[1]

R. D. Reynolds

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Levying fines for violations of forest fire laws often creates harmful animosity. Many foresters believe that if the forest ranger is also a law enforcement officer his effectiveness as a teacher of forestry is impaired. They believe that if handled separately as an administrative function by a carefully trained officer it can be made a more potent force through pedagogy. How this is done in two widely different regions in California—Los Angeles city and the redwood region—is set forth by the author. He believes that the success already achieved in California merits a much wider application of educative law enforcement when coordinated with individual responsibilities, and that the real purpose of the law is more effectively met by such policy than if punishment alone is the fire agency's basis of enforcement.

LAW ENFORCEMENT is playing an increasingly major role in fire prevention and protection in California. Used in a unique and different fashion in the redwood region, it has become perhaps the principal factor in lowering the occurrence and severity of fire. Significantly, a large metropolitan area, Los Angeles city, practices a similar law enforcement policy in its fire prevention efforts.

The practicability and possible wider use of fire prevention, premised on law enforcement programs that incorporate sound principles of education rather than simply reprimanding, is indicated by the general similarity of the law enforcement policies and practices in these two diverse regions.

Under California statute law, three courses of action are open to forest agencies for law enforcement. These are:

(1) *Administrative action*: Allowing the forest officer to work with the violator by personal interview, correspondence, etc. It is an educative device.

(2) *Civil action*: Involving a case warranting civil suit. It is brought to bear in order to collect suppression costs from a violator for fires occurring on his land. If lack of diligence and prudence in his use of fire, or negligence in cases of fires originating on his lands for unknown reasons, can be proved, the landowner is considered liable. *This can be educatively used.*

(3) *Criminal action*: Where arrests are usually made and the violator is prosecuted on the basis of criminal law. (6)

Los Angeles City Fire Department policy encourages public responsibility for taking initial action on fires. The department attempts to make the public aware of this responsibility, under law, by *administrative* and *civil action* analogous to state actions previously mentioned (*1*). Criminal action is considered extreme by the department. Its policies are based on the premise that most people are ignorant of the law and its meaning, rather than of criminal intent. If it can be shown that a person is guilty of negligence, there is

[1]The author is indebted to Professor Emanuel Fritz of the University of California for the untiring and inspiring quality of his criticism and comment on this paper. To Deputy State Forester F. H. Raymond and especially Fire Prevention Officer S. L. Schick of the California Division of Forestry the author is indebted for many of the ideas discussed and for thorough criticism received on the initial drafts of this paper.

a chance for pedagogy where more extreme action might do harm to the department and its final objective—fire prevention. Officers handling cases usually operate in neighborhoods in which they have only a professional connection. This relieves them of the burden, often carried by forest officers, of having to deal with violators who, in private life, may have a personal relationship with the enforcing officer.[2]

The Los Angeles City Fire Department fire prevention program, as it relates to law enforcement, is based on the following points:

(1) The land owner has some responsibility for fires occurring on his land.[3]

(2) The reason for most fires is negligence, ignorance, or lack of prudence rather than criminal intent on the part of the party responsible for the fire.

(3) Action aimed at elimination of these causes is best achieved through pedagogical principles rather than simply punishment.

(4) Law enforcement properly administered by trained personnel has a major contribution to make in preventing fires when used educatively on the basis of administrative and civil law action (*1*).[2]

Until the past decade, the fire problem in the redwood region involved incendiarism, and was complicated by ignorance and misconception of the impact of fire. This, however, is the core of the problem and is meaningless unless viewed in its context, i.e., the geographic, economic, and social factors affecting the area (*2, 3*).[3]

The redwood region comprises two distinct geographic areas—the "redwood-belt," and the adjacent range lands, interspersed with Douglas-fir forests. Economically, these two geographic areas give rise to two basic industries. These are: the lumber industry, concentrated in the "redwood-belt," and the sheep and cattle interests, utilizing the natural ranges and cutover Douglas-fir lands adjacent to the redwoods.

Up to a few years ago, some timber owners, and later stockmen, attempted to convert cutover and brush lands to range lands by burning methods. Furthermore, they thought that "opening up" or "fire proofing" the redwoods was a necessary and good thing. Therefore, little attempt was made to control fires burning from "range-clearing" operations into timberlands. The misconception that "you can't kill the redwoods" probably served to nourish such "fire proofing" activities (*5*).[4]

The general character of these land-clearing operations was such that many fires became wildfires which might—and in fact did—burn neighboring range and timbered property. When such events occurred, they occasionally aroused animosity among stockmen and their kind, or betwen stockmen and timbermen.

The redwood belt was exempt from the California Fire Prevention Laws until 1945. Foresters, as well as timbermen, approved this exemption. However, even though there was mutual agreement and approval on this factor, the writer ventures the opinion that the exemption served further to aggravate a potentially dangerous fire situation.

The Great Depression and World War II made available for fire fighting purposes abundant man power, in the form of CCC and military personnel. Government agencies, as a result, tended to assume greater control of actual fires than ever before. Subsequently the property owner was inclined not to take an active part in suppression of fires on his own land (*7*).[5]

In 1943 the incoming state forestry administration faced the following problems:

(1) The general public honestly believed that fire would not damage the redwood forests.

(2) They also believed that the brushfields on cutover lands were worthless and should be cleared by traditional burning practices, to facilitate stock raising and hunting.

(3) The people expected from agencies charged with fire protection in the area, lax or ineffectual law enforcement.

(4) The property owner was not actually aware of his responsibility in the care and use of fire, nor was he acutely aware of his duty under the law to take some action on all fires occurring on his own land (*7*).[5]

These factors led to incendiary practices which were "not so much by malice as with the real feeling that fires were necessary and desirable". (*4*). The administration found it "not only desirable but necessary," after a study of the problems with which it was faced, "to classify [administrative] functions comprehensively and systematically with responsibilities clearly and strategically defined." Of particular importance was that "law enforcement could be more than merely an incidental [component] to fire control administration." It was evident, in fact, that "no administrative function has more direct influence for good or evil, or for the creation of a respect or disregard of law." (*6*).

Further, it was determined, most infractions of the law bearing on the fire situation were those held by the law to be torts: i.e., lack of deliberate intent to harm but for which redress may be sought in civil court (*8*). This being the case, it was believed that well supervised administrative action, pedagogically applied, should predominate in law enforcement administration. Coordinated with administrative action, would be careful use of civil action in difficult cases. From these theoretical studies action was formulated, based on the following premises:

(1) That a private property owner has

[2]Verified by interview with Fire Prevention Chief Robertson, June 14, 1949.

[3]Contributory causes and effects of this attitude are discussed in the California Forestry Study Committee Report of 1945 to the California State Legislature: "Fire protection efforts are weakened if fire laws are not enforceable. In the past the laws have frequently been flaunted through lack of support from the local public and by the lower courts. A great many instances can be cited of local justices of the peace refusing even to accept cases against incendiaries and some have threatened the rangers for bringing fire cases into their courts. . . . (These) practices arise from old local customs of burning at will to 'open the country,' and local justices have in some cases themselves favored such burning."

[4]In 1945 Emanuel Fritz indicated the seriousness of the situation, in the redwood region in particular, by his statement, ". . . many ranchers deliberately permit or expect their fires to encroach on neighboring *cutover* lands in order to widen their area of grazing, and some deliberately set fires on such lands."

[5]Regarding this issue, F. H. Raymond stated in 1945 that ". . . due to an abundance of man power provided by the Civilian Conservation Corps and military forces private owners have in many cases *lost sight of their responsibilities in Fire Prevention and Suppression and the essential moral factor of neighborly helpfulness.*"

some responsibility for all fires started by him on his own land or occurring on that land.

(2) That the individual must be "made aware of the necessity for [a] particular law and its implications to his rights and to others," if the objectives of good forestry are to be met (6).

(3) That prevention of fires is best done by pedagogical processes rather than by fear.

It was intended that action based on these principles could be carried out by a properly designed administrative organization operating upon a planned strategy drawn from the studies made of the area.

The state's administration in the redwood region differs fundamentally from other forest agencies in its fire prevention methods. This difference derives primarily from its law enforcement policy being based on pedagogical principles rather than fear. The fire prevention program is predicated on educative law enforcement principles to a greater extent than any other forest fire control agency in California. Its working principle is enforcement by administrative action and civil action at every opportunity. Prosecution, when necessary, is considered "a complete failure to the whole objective of their forestry and fire control program if the individual is not made aware of the necessity for the particular law and its implications to his rights and others, *regardless of the judical outcome of the trial*" (6).

Another contrast, and somewhat at variance with common practice, is the clear delineation of duties between the field man and the law enforcement administration. The field man is expected "to report and take coordinate action" with the law enforcement administrator (6). He does not directly handle law enforcement in his own district. His function is to inspect, inform, and teach the public its duties and responsibilities under law, suppress fires, and encourage good forestry. Trained law enforcement personnel handle any legal or controversial matters needing attention, at the administrative, civil, or criminal levels. This delineation leaves the field man free to cultivate public confidence in his profession, unhampered by a feeling toward him on the part of the public that he is "a representative of the law." Rather he is encouraged to act as a consultant to whom anyone may come for information regarding forestry matters or the use, prevention, and control of fires. He is not a policeman, nor need he be "keen legally."

Fire permits state only that the owner of the land is "Authorized to burn in accordance with the law." Specific instructions simply state "The burning shall . . . . be regulated in magnitude to insure control by number of persons . . . . [present]." Emphasis is placed on the legal fact that the owner is held solely responsible to control his fire under all reasonable circumstances. This procedure, combined with civil law action, has produced an awareness, in the local public, of the importance of care and knowledge in the use of fire.

Administrative action in law enforcement cases usually consists of a personal contact, at the scene of the fire or during an inspection of forest operations by the field officer. A report on this contact is sent to the district office. Action is taken on *every* fire or infraction reported, in accordance with the information submitted in the report. Usually, in cases of fires of unknown origin, the land owner concerned receives a letter from the law enforcement officer framed in such a manner as to enlist the party's interest and cooperation. This letter is usually sent to the party concerned in the spring following his fire. The letter informs the owner of his responsibility and the risks involved in negligence, or the lack of diligence and prudence on his part when fire occurs on his land. It may also carry a note regarding previous infractions of the law, if their were any, and thereby serves as ample warning as to what action will be necessary in the future if the problem recurs. It is felt that the time interval adds to the psychological impact of the letter when the owner, if he was responsible for the fire, realizes that the law "has a long memory."

Cases where criminal or civil action is resorted to are not rushed. On the contrary, every phase of the pedagogic principle is carried out before the case is brought up before adjudication. When court action is commenced, the case is based on good legal principles; everything possible has been done to make the defendent realize the justice of the action.[6]

These processes of dealing with the legal and controversial issues arising in the course of public relations are the responsibility of the law enforcement administrator within the organization. Conclusion of a case is not considered successful or desirable if the violator is merely punished according to law. It is a successful case only if the person has learned a lesson in fire prevention and its meanings. Every fire occurring in the district has some fire prevention action taken on it individually by the law enforcement administrator's office.

The residents of this region are in the process of learning the meaning and need for fire prevention—a lesson that is not accomplished easily and at once, but one that advances surely and through what sometimes must be felt to be very hard experience.

Evidence that these people are learning this lesson is readily apparent. A fire truck arriving at the scene of a fire on private land now often finds the fire either out or the owner and his neighbors actively engaged in suppressing it. Five to eight years ago the attitude would have been to "let 'er go," "she can't go nowhere," or the perpetrator would have left the scene for town, where he could be seen publicly, as an alibi.

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[6] *Civil action*, properly handled, has the following technical advantages, other things being equal: (1) *Civil cases* based on torts obviate the necessity of proving that a person actually started the fire. If negligence, or lack of diligence and prudence on the part of the property owner can be proved, he becomes liable. (S. Schick, *Doctrine of Tort*.). (2) It alleviates the problem of making the forester appear as a teacher rather than a policeman. (3) The defendant never appears as a criminal since his violation is a civil one. (4) The case is not tried before a local justice of the peace but in the higher courts.

Fire patrolling is now considered a phase of the property owner's duty on fires occurring on his land, thus relieving public agencies of a burden during the dry season. Formerly fires were usually patrolled only if they constituted a threat to improvements or buildings. There are not as many permit-burns "running away." Fires do not recur on the same property, as they once did. There has been no substantial increase in fire occurrence (despite an unprecedented increase in rural and urban population), and the annual over-all area burned has been materially reduced. Fire reports show the latter to be due to spirited initial action being taken on fires by the local residents. The former is due to the effectiveness of the administrative policy. This is emphasized when we consider that "less than one percent of the people worked with since 1945 have been involved in a second fire". (6).

The people of the redwood region are beginning to realize that fire occurring on their land is really their problem, i.e., their responsibility. They realize that the state wishes to help them if they help themselves by assuming that responsibility which is theirs as defined by law.

Summary

The law enforcement function, administered with care and skill on the basis of administrative and civil action, by an efficiently designed organization, is proving to be a powerful fire prevention tool in the timber and range areas of the redwood region specifically, and has promise of doing so in California generally. The fact that two distinctly different regions, Los Angeles city and the redwood region, being geographically and socially dissimilar, emphasize the law enforcement aspect of fire prevention, and practice similar techniques, stresses this point, and indicates a possibility of more general application of these measures.

There is a tendency for governmental agencies to proceed from theoretical studies of a problem facing a geographically and socially homogeneous area to practical design of the administrative function of government and to do this by means of advanced coordination and planning.

Further, the law enforcement function in the hands of trained personnel assumes its larger and perhaps proper role as an educative device when used in an organization properly balanced between clearly defined field work and intensive administrative and civil law actions.

Responsibility, then, which here implies proper knowledge of land management, tends to be restored into the hands of the populace, by administrative techniques discussed herein.

Literature Cited

1. Arnebergh, Roger. 1948. Ways that may help the fire prevention effort. Speech delivered at meeting of Southern California Fire Chiefs' Conference, Southern Division, on January 26, 1948, at San Bernardino.
2. Baxter, E. J. 1943. Then and now. California State Division of Forestry, Dept. of Natural Resources, Sacramento. Pp. 1-35.
3. California Forestry Study Committee. 1945. The forest situation in California. Vol. 1, California State Printing Office, Sacramento. P. 101.
4. Fritz, Emanuel. 1932. The role of fire in the redwood region. University of California, College of Agriculture, Agricultural Experiment Station, Berkeley, Calif.
5. ———. 1945. The 1945 fire season and its lessons. Berkeley, Calif.
6. Raymond, F. H. 1943. A study of law enforcement administration. California Division of Forestry, District 1, Santa Rosa.
7. ———. 1945. Points leading to the state's better coordinating its efforts with private and public management. 36th Meeting of the Western Forestry and Conservation Association, Portland, Ore.
8. Schick, S. et al. Fire prevention and the doctrine of tort.

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Cooperative Wildlife Management on the Virginia State Forests[1]

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MOST FOREST GAME species, such as the deer and the wild turkey, require large areas of land, and the acquisition of such large tracts exclusively for wildlife production usually is not economically feasible. In practice, most of the areas of adequate size for deer and wild turkey management are acquired for forest management purposes. Large publicly owned areas, acquired for forestry purposes, are administered by professional foresters. Wild game, of course, is the legal property of the state (*3*) and is administered by a state agency in each of the forty-eight states. So in many instances one public agency, either state or federal, owns the land and some other public agency is charged with the responsibility for the wild game on that same area. All too often, it is difficult for the forest administrator and the wildlife executive to get together and reach an agreement as to the cooperative management of wild game. Agreement between two independent public agencies on a general policy for wildlife management of such areas often is the first, and the most difficult, administrative problem in securing intelligent wildlife management on public lands.

Officials of the George Washington and Jefferson National Forests and of the Virginia Commission of Game and Inland Fisheries worked out a mutually acceptable program for the management of the wild game on these two Virginia forests almost 15 years ago. In order to put this program into action, it was necessary in 1938 (*2*) to secure enabling legislation from the Virginia General Assembly. The enabling bill authorized the Virginia Commission of Game and Inland Fisheries to enter into a wildlife management agreement with the U. S. Forest Service and, as a part of this program, to charge a special fee of $1 for each special-use permit to hunt, fish, and trap on the two national forests. The funds so collected were to be used exclusively, under an annually approved budget, for wildlife work on the approximately 1,500,000 acres of national forest land in Virginia. Setting up the general program and policies was readily accomplished. The mechanical operation of the program was then turned over to staff members of each agency. The entire program immediately proved highly successful in producing wildlife and is popular both with the two public agencies and with the sportsmen (*4*). By 1940 the program of cooperative wildlife management had been tried and proved. This successful program on the national forests was instrumental in the early establishment of a similar cooperative wildlife management program for the Virginia state forests.

In 1940, some 40,000 acres of land in central Virginia, which had been acquired and developed by various federal agencies as an emergency relief project, were turned over to the U. S. Forest Service which, in turn, granted a long-term lease for this land to the Virginia Forest Service. The Virginia Forest Service administers this land as a part of its state forest system, and has designated these areas as the Cumberland State Forest (15,000 acres), the Buckingham-Appomattox State Forest (18,500 acres), and the Prince Edward State Forest (5,800 acres). The areas are located almost in the geographical center of Virginia, and each of the three areas is within 25 miles of the other two. The method of land acquisition resulted in many interior holdings, with federally owned land scattered over a much larger area than the acquired acreage might indicate. The large number of private holdings within or impinging upon government owned land has engendered many administrative problems none of which, however, has proved as serious as it was originally thought.

The three areas were originally purchased as submarginal farm land and, when turned over to the Virginia Forest Service in 1940, less than 5 percent of the approximately 40,000 acres was in open, abandoned fields. Thus, farm game did not offer appreciable opportunities for management. The principal game species was the wild turkey. Deer were present on all three areas, but in very limited numbers. It was only natural therefore, that forest game, with emphasis on the wild turkey, was given top priority in the state forest wildlife management plan.

Officials of the Virginia Forest Service and the State Game Commission began work on a wildlife management plan patterned after the successful national forest cooperative program. A plan was prepared, approved by both agencies, and enabling legislation secured to legalize the agreement in time to open the three forests to controlled hunting in 1940. It was the writer's privilege to work on these areas prior to their transfer to the Virginia Forest Service and to serve as the Game Commission's field representative in connection with the execution of the wildlife management program on the state forests for several years thereafter.

Under the original management plan the responsibilities of each of the two agencies were clearly outlined: (1) that an annual wildlife production and wildlife harvest plan be prepared; (2) that an annual budget be prepared; and (3) that the Game Commission employ a full-time state forest-wildlife manager, and the Virginia Forest Service provide a residence and other equipment for him.

The mechanics of the operation

[1] Release No. 50-6, Virginia Cooperative Wildlife Research Unit; Virginia Polytechnic Institute, Virginia Commission of Game and Inland Fisheries, Wildlife Management Institute, and the U. S. Fish and Wildlife Service, cooperating.

of this plan were turned over to the state forest ranger, representing the Virginia Forest Service, and the district game technician, representing the Game Commission. The actual execution of the plans on the ground was worked out by these two individuals in conjunction with the resident state forest wildlife manager. In essence, administrative problems resolved themselves into procedures for increasing wildlife production and the regulation of the harvest of this wildlife.

Wildlife Production

As mentioned previously, approximately 5 percent of the area was in open fields when these state forests were leased to the Virginia Forest Service. In order to hold the wild turkeys on the state forests, to increase food production, and to maintain openings for the use of wildlife, one of the first problems attacked was concerned with the maintenance of strategically located openings. This was accomplished by two methods. The state forest wildlife manager was given equipment to put in annual food plantings. In addition, suitable land located close to neighboring farmers was leased for a corn-wheat rotation every 5 years. Experience indicated that it was necessary to cultivate areas to be maintained as openings at least once every 5 years in order to prevent invasion by woody plants. Approximately 10 years of experience with this work has shown that about 2½ percent of the 40,000 acres can be maintained as open areas for wildlife, using both of the above systems. One of the problems now presenting difficulty is that the increase in the deer herd on all three forests makes the use of annual food plantings for the upland game species impractical. No solution to this problem has been reached.

The maintenance of openings through a system of share-cropping has proved very satisfactory. A rental of one-quarter of the grain produced by these farmer lessees results in a small amount of revenue and, in addition, produces grain for emergency feedings should severe weather dictate its desirability. Results of this phase of the program have been highly successful and have presented very few administrative problems. Agricultural crops produced by neighboring farmers on state forest property have not been subjected to appreciable damage by deer.

Several years experience soon indicated that the Prince Edward State Forest, consisting of about 5,800 acres, was too small to be administered satisfactorily for forest game. The amount of forest game which could be produced on this size area did not justify the time and effort required. For that reason, most of the activities have been confined to the Cumberland and Buckingham-Appomattox State Forests.

In 1948 a revised management plan was prepared and the land-management program was greatly augmented using Pittman-Robertson funds. These funds made it possible to put a resident manager both on the Buckingham-Appomattox State Forest and on the Cumberland State Forest. A majority of the land development program including boundary marking, posting, and cleared-area maintenance or development was brought up to date as a result of this program.

The land development program on the state forests, as elsewhere, presented no unusual difficulties. On the other hand, the evolution of a system for controlling the harvest of game in such a manner as to insure continuous production was more perplexing. The writer is inclined to agree with Allen (*1*) that the law of diminishing returns normally is satisfactory in limiting the harvest of farm game to reasonable proportions. On the other hand, the high trophy value of such animals as the deer and especially the wild turkey, results in almost relentless pursuit even to the last animal. The end point of diminishing returns with such species often approximates zero, especially if the hunting is confined to relatively isolated areas such as the state forests.

Wildlife Harvest

The size of the three state forests made it necessary to consider opening these areas to supervised hunting only, rather than to general hunting, as was practiced on the national forests. In the 1940 wildlife plan, it was proposed to regulate the number of hunters using the state forests in such a manner as to permit them to remove only the harvestable game. As the principal species was the wild turkey, the objective of the supervised hunt was set at an annual harvest of from 25 to 35 percent of the turkey population, including shot and lost game. The best manner of attaining this objective appeared to be (1) charge each hunter using the state forest a special fee of $1, thus partially limiting the number, (2) require each sportsman to report through a checking station each day he used the forest and to check out at a similar station at the end of each hunting period, and (3) limit the number of hunting days. This system of controlling the harvest of wild game proved reasonably successful and has been practiced, with minor modifications, for each succeeding state forest hunt.

The state forests have been noted for their wild turkey population, and they are the only publicly owned areas in central Virginia open to hunting. Thus, it was anticipated that the hunting pressure would be appreciable and would present a number of administrative problems. When the forests were first opened to hunting in 1940, after having been closed for some five or more years when the property was being acquired, the management plan called for the operation of five check stations where hunters could obtain the required hunting permit. It was necessary for each hunter to pass through a checking station at the beginning and end of each day's hunt. The charging of a special fee to hunt on this area was designed to limit the number of hunters and to allow for some supervision of their activities. In addition, it presented an opportunity to have a rather complete

record of the hunter use and of the kill. The original hunt in 1940 was for a 6-day period beginning on Thursday with an intervening Sunday during which no hunting was allowed. After a year's experience, this was changed so that the 6-day hunt extended from Monday through Saturday with no rest day. The inclusion of a rest day resulted in an increase in the kill of turkeys, which suggested the change.

The hunter check stations are manned by personnel of the Game Commission, the Virginia Forest Service, and by temporary local help. One station has been operated satisfactorily from the home of a local resident, and another equally satisfactorily, is operated by a local store owner in her place of business. Special forms were prepared so that the hunting permit could be issued in duplicate, thus meeting the requirements of the state auditor and the state game code. The original copy of the permit is given to the hunter and the carbon copy is retained by the check station operator. The time when hunting began and stopped, as well as the game kill, is recorded on the original and duplicate of each permit. At the beginning of the program, identifying buttons were issued to each hunter, but since many of these buttons were lost and there was evidence that they were often exchanged with hunters who had not come through the check station, the use of identifying buttons was discontinued. The Virginia Commission of Game and Inland Fisheries assigns state game wardens and conservation officers who, with personnel of the Virginia Forest Service, patrol small sections of the forest during the annual hunt. These officers are able to keep a reasonably close check on all hunters in their assigned area. Thus, the enforcement of the requirement that each hunter secure a permit and check in and out of the checking station each day has presented only one serious problem. Annually from 5 to 10 percent of the hunters using the area fail to check out after they have completed their hunt. Administratively, it has been found desirable to address a form letter to each of the hunters who fail to respect this regulation, requesting the necessary information. If this request is not answered their names and addresses are sent to the local game warden who calls upon them and obtains the required data.

The state forests are operated under such a flexible plan that the number of days of hunting, the daily bag limit, the sex of the species taken, and all other matters relating to the harvest of the game crop can be regulated. For example, deer may be taken on one forest, but not on another. Gobblers only may be taken on one forest and both sexes on another, or one forest may be entirely closed to hunting and the others opened. Complete control is exercised under the enabling act and under the cooperative agreement so that wildlife production and harvesting may be manipulated under any plan mutually agreeable to the Virginia Forest Service and to the Virginia Commission of Game and Inland Fisheries.

Hunter Use of the State Forests

A detailed analysis of the comparable data collected during the 10-year period, 1940-1949, is not possible because some of the forests have not been open to hunting during certain years and the list of species which could be taken has varied from year to year. However, all three forests were operated under identical regulations for the first 6 years, 1940-1945, and some of the more pertinent data collected during this 6-year period may be used as a measure of the success of this program. The wild turkey is the principal game species of these forests, and it was used in judging the degree of success in wildlife production and harvesting. Data for the 6-year period, 1940-45, indicate an average of about 6,600 hunter-hours use per year, with an average annual kill of 50 wild turkeys. Consequently, it required about 130 hunter-hours per wild turkey killed and the average harvest of wild turkeys for the approximately 40,000 acres was one bagged turkey per 800 acres. Assuming an average annual budget for the state forest wildlife program of $3,000 per year, these figures would indicate that the total cost of this wildlife program is $0.454 per hunter-hour use. This cost figure does not take into account the revenue produced through the sale of hunting permits and other wildlife-produced revenue, nor does it consider the amortization cost of equipment. It is believed that this production is good and that the cost per hunter-hour use is not excessive for a publicly owned shooting preserve. It is questionable that private preserves can improve these figures to any appreciable degree. If wildlife had to bear all cost of land acquisition, area supervision, and similar costs, it would be impossible to supply public hunting at 45 cents per hour of hunter use.

The administrative problems connected with the management of publicly owned lands for wildlife are not excessive, can be satisfactorily worked out to meet local conditions, and are not difficult to apply in the field *provided* the land administrator and the wildlife executive can agree on an overall program, as has been done in Virginia. Supervised public hunting is in great demand and is one way that the state wildlife agency can cope with the increased hunting pressure. Cooperative management of public lands for forestry and wildlife is feasible as proved by the program on both the national and state forests in Virginia.

Literature Cited

1. ALLEN, DURWARD L. 1947. Hunting as a limitation to Michigan pheasants. Jour. Wildl. Mgmt. 11(3):232-243.

2. DELABARRE, CECIL F. 1946. Cooperative wildlife management in Virginia. Trans. 11th N. A. Wildl. Conf. Pp. 313-323.

3. DUPONT DE NEMOURS AND COMPANY, INC., E. I. Game, its legal status. E. I. duPont de Nemours and Co., Smokeless Powder Div. Pp. 1-50. Wilmington, Del.

4. FEARNOW, T. C. and I. T. QUINN. 1949. Action on the Blue Ridge. Dept. of Agriculture Yearbook 1949. Pp. 586-592. Washington, D. C.

A Test of Pelleted Jack Pine Seed

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WITH 50 TO 75 MILLION acres of forest land in need of artificial regeneration in the United States, better methods of seeding and planting are vitally needed. Among the methods tried in recent years has been the use of pelleted seed sown directly in the field. The seed is coated with several layers of material which is hard enough to withstand handling in sowing devices and yet will break down rapidly enough when moistened so as not to inhibit germination. Rodent repellents, fertilizers, and other materials often have been incorporated in the pellets.

Pelleted seed was tried on a small scale during the first World War, but the first large-scale use was by sugar beet growers during the second World War. Thereafter some large areas of range land were reseeded with pelleted grass seed[2] and several smaller areas with pelleted tree seed. Unfortunately there was more premature publicity than accurate reporting of results.

In 1947 the Lake States Forest Experiment Station participated with other agencies in a test using jack pine seed hand-pelleted with several different materials. Results were unfavorable, but the development of commercial pelleting methods with other materials has made further exploratory tests advisable.

Background for the Tests

As a basis for planning new tests, information was obtained early in 1949 from all agencies known to have tried pelleted forest tree seeds. This disclosed that about a dozen different agencies had tested tree seed pelleted with about twenty different combinations of materials. Trials had been made in the South, the Lake States, the far West, and Canada, on various soils and with different kinds of ground preparation. Jack pine, loblolly pine, longleaf pine, ponderosa pine, red pine, slash pine, eastern white pine, western white pine, Port Orford-cedar, black spruce, Norway spruce, Sitka spruce, and white spruce had been tested. Results were predominantly poor, occasionally fair, and rarely good. In one case only did pelleted seed give results better than those with bare seed. Usually bare seed produced equal or better results.

How the Tests Were Made

Since jack pine had not been pelleted commercially, and since past trials had shown this species to be one of the best for direct seeding in the Lake States, it was selected for this exploratory test.

The seed used was a composite sample including Minnesota, Wisconsin, and Michigan collections. Its potential germination was about 50 percent.

Two kinds of commercial pellets were used. In Type A the pelleting material was reported to be 65 percent feldspar and 35 percent fly ash. The pellets were somewhat irregular, since they were approximately the shape of the seed. The average weight of 1,000 of these pellets was 32 grams as compared to 3.7 grams for 1,000 bare seed.

In Type B the pelleting material was reported to be montmorillonite, a highly colloidal aluminum silicate. The pellets were spherical and very uniform in size. The average weight of 1,000 pellets was 92 grams as compared to 3.7 grams for 1,000 bare seed.

Since impurities in the seed become pelleted as well as the seed itself, cutting tests were made of both kinds of pellets. Of the Type A pellets, 95 percent contained seed, but 2 percent contained 2 seeds. There were, therefore, an average of 97 seeds per 100 pellets. Of the Type B pellets, 96 percent contained seed. No pellets had more than one seed.

Plot establishment.—This study was planned to show how pelleted jack pine seed compares with bare seed, and how surface sowing compares with conventional sowing. The latter phase was brought in because there have been some indications in the Pacific Northwest that germination of pelleted seed is poorer when the pellets are covered than when they are sown on the soil surface.

Five treatments were applied to plots laid out in the form of a Latin square. In each plot, 100 seeds or pellets were sown the first week in June. The plots were examined for germination and survival at 10-day intervals for the first 40 days and at 30-day intervals thereafter until October. At the October examination every tenth tree, or the nearest living one thereto, was measured to the nearest half inch from the ground line to the top of the terminal bud.

In order to avoid serious losses from drought or other factors which might obscure the effects of the treatments, the test blocks were established in nurseries where some control of conditions is possible. One block was established in each of three nurseries: Hugo Sauer Nursery near Rhinelander, Wis.; Eveleth Nursery near Eveleth, Minn.; and the Michigan State College Nursery near East Lansing, Mich.[3] A check series was run in the station's seed laboratory at St. Paul.

Germination data were subjected to an analysis of variance to determine statistical significance and interaction of the variables tested. Height data were insufficient for statistical analyses.

Results of the Test

Although germination varied at

[1] Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota, at University Farm, St. Paul 1.

[2] Wagner, Joe A. Results of airplane pellet seeding on Indian reservations. Jour. Forestry 47:632-635, August 1949.

Wagner Joe A. and Clarence P. Kinkor Will pellet seeding work? Amer. Forests 56(5):25, 44-45, illus. May 1950.

[3] The plots were established and observations made by (1) J. H. Stoeckeler of the Northern Lakes Research Center at the Hugo Sauer Nursery, (2) L. P. Neff of the Headwaters Forest Research Center at the Eveleth Nursery, and (3) W. F. Boughner of the Lower Peninsula Forest Research Center at the Michigan State College nursery.

TABLE 1.—PERCENTAGE OF LIVING SEEDLINGS AT END OF GROWING SEASON

Treatment	Percent of seed sown producing seedlings[1]			
	Hugo Sauer nursery	Eveleth nursery	Michigan State College nursery[2]	Seed laboratry[3]
	Percent			
Bare seed, sown ¼ inch deep	32.4	34.2	21.2	41.0
Type A pellets, surface sown	5.2†	8.4†	.4†	28.0*
Type A pellets, sown ¼ inch deep	18.4†	17.8†	1.8†	48.0
Type B pellets, surface sown	2.0†	11.8†	.6†	6.0†
Type B pellets, sown ¼ inch deep	39.2	28.4	13.2†	48.0

[1]Potential germination of laboratory sample was 51 percent.
[2]Results are from July 1 examination because of considerable mortality thereafter. For the other two nurseries, results are from October examination.
[3]Germination at 40 days.
*Significant difference from bare seed at 5 percent point.
†Significant difference from bare seed at 1 percent point.

the different locations, these facts stood out (Table 1):

1. Bare, untreated seed sown at the standard depth for jack pine (¼ inch) germinated as well as any of the pelleted treatments and better than most of them.

2. Type B pellets, sown at a depth of ¼ inch, generally germinated as well as the untreated seed; the Type A pellets generally germinated more poorly.

3. Surface-sown pellets produced many fewer seedlings than those sown at ¼-inch depth. It was noted in the laboratory that many seedlings from the surface-sown pellets died before they were able to get their radicles into the soil. It was noted also that the Type B pellets, although harder, disintegrated much faster than the Type A pellets when they were moistened.

4. The Type B pellets generally gave better results than the Type A pellets.

At the Michigan nursery, the seeding was done in new beds on soil somewhat heavier than is preferred for pine and in which there was considerable loss from damping-off. These conditions probably account for the relatively poor results at this nursery.

At the Eveleth Nursery the plots became overgrown with a heavy growth of weeds by mid-July. A mineral spirit spray controlled the weeds without apparent damage to the seedlings.

It is possible that birds and rodents may have destroyed some of the seedlings from surface-sown pellets. However, observations at the Eveleth Nursery indicated that birds did not bother the pellets.

What These Tests Mean

One purpose of pelleting seed has been to provide more economical use of seed through better control of distribution in sowing. The uniform shape and size of pellets makes it possible to use them in metering devices in seeding from airplanes, hand-seeding tools, or other apparatus. The hardness of the pellets makes it possible to use them in various types of apparatus without injuring the seed.

Another purpose of pelleting has been to incorporate materials which would improve seedling establishment by repelling rodents and birds, preventing diseases or aiding growth. Many substances have been added to pellets, but so far none seem to have been successful in repelling rodents in forest or range seeding.[4]

It was not the purpose of these tests to show how well pelleted seed performed in sowing devices or withstood rodent or bird damage. However, the tests did show that it is possible to obtain germination from some commercially pelleted jack pine seed equal to that from untreated seed. Unless there is some advantage beyond satisfactory germination, however, the added cost of pelleting does not seem justified. The added weight (8 to 25 times that of bare seed) might also be a disadvantage in some instances.

Probably the main advantage of using pelleted seed in reforestation would be the possibility of establishing seed spots without the development of multiple seedlings. Since satisfactory germination is possible with pelleted seed, the main requirement aside from protection against rodents and birds would seem to be a suitable seeding tool which would plant one pellet at a time. A promising tool has been devised in the Pacific Northwest, and it may be suitable for use in the Lake States.

As other types of pellets or pelleting materials become available, additional tests on jack pine and other species may be warranted. Further field tests would also be worth while with the present kinds of pellets as other repellents become available.

[4]Rudolf, Paul O. Pelleted seed for reforestation. Lake States Forest Exp. Sta. Misc. Report No. 5. 7 pp. (proc.), June 14, 1949.

How Mechanical Efficiency is Being Increased in the Southern Pine Industry[1]

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For several decades southern pine lumbermen have advocated greater mechanical efficiency in their manufacturing processes, but until recently little has been done in an organized way to accomplish this objective. As the result of changes in working conditions brought about by reduced hours of employment, increased wage rates, severe competition from other woods and substitute materials, and other disturbing elements, the present economic status of the southern pine industry is one which leaves much to be desired from the standpoint of increased efficiency.

This article may sharpen the understanding of those who are conscious of the benefits to be derived through increased efficiency and greater mechanization.

MORE EFFICIENT methods for producing southern pine lumber is the most important need confronting the industry today.

As a positive approach to this problem, progressive lumbermen in the industry have formulated a program to study all possible new techniques and better methods which will ultimately lead to greater manufacturing efficiency. This study will show how individual southern pine lumbermen have eliminated needless delays, cut down their total processing time, conserved labor, and improved the mechanical efficiency of their operations, and in so doing increased their output, improved the quality of their product, and cut their costs correspondingly.

As the need presented itself, it obviously fell on the lumber manufacturer to take the lead in the improvement of machinery, the development of new labor saving devices, and in improved plant layouts. There are conspicuous exceptions to this rule, however, because close on the heels of the lumber manufacturer came the producers of machinery and equipment, who happily coupled their genius with the users' necessity in developing new inventions and improving existing equipment.

Lumbermen outside the southern pine area are also striving to improve the efficiency of their plants and raise the quality of their product. Additional research looking to further plant and product improvement in the Northwest, for example, which has been highly mechanized for years, is today a challenge to southern pine lumbermen.

The southern pine industry has been able to meet this highly mechanized competition in the past largely through two specific factors: one, the abundance of unskilled common labor, and two, a uniformly dried product, seasoned to definite moisture content limitations. But whatever advantages these represented are now being threatened. In the first instance by the general increases of wage levels and a corresponding decrease in labor efficiency, which means advanced labor costs through high percentage of common labor employment. Secondly, by the fact that improved plant and product programs in other regions places considerable emphasis on improved drying methods to assure properly seasoned products. Such gains made by other species must now be offset by a greater and more united effort for mechanical efficiency in the southern pine industry.

Much progress has already been made. But the final results and benefits of this determined effort should enable southern pine lumber manufacturers to look into the future with assurance that their plants are operating under the highest degree of efficiency, their timber being cut under the best forestry practices, and their highly mechanized mills producing lumber that will consistently continue to excel in the competitive market with other species, as it has in the past.

The Cost Problem

Generally speaking, there have been no revolutionary changes or improvements in sawmilling practices in the South for many years. The southern pine industry today is paying the highest wages in its history, and there is danger that additional increases may result in curtailed production unless drastic action is taken.

It is true that the industry has always been handicapped by the high ratio of man-hours required in the production of southern pine lumber, and this problem will become increasingly burdensome should wage rates go higher. Lumbermen, therefore, must devise ways and means of economizing and changing their manufacturing techniques if they are to overcome the high level of wages and other steadily mounting production costs. They can no longer depend upon outmoded methods and worn out machinery and equipment to win for them the trade war against other materials.

Prior to 1938, mechanization in the southern pine industry was directed primarily toward producing lumber with the least possible effort. Since that time, the nature of new developments and production techniques was dictated by the heavy demand for lumber occasioned by war requirements and postwar housing. More recently the objective of technological change has shifted to the lowering of production costs as the result of wage increases imposed by the Fair Labor Standards Act. The southern pine industry therefore, of necessity, is compelled to obtain greater productivity from labor than it has had in the past.

Southern pine total costs have reached an all time high according

[1] Presented at a meeting of the Wood Industries Division, American Society of Mechanical Engineers, held in Washington, D. C., April 14, 1950.

to latest statistics which reveal that total costs for mills in all groups have increased 11.1 percent for 1948 over the preceding year. The cost to produce, sell, and ship southern pine lumber, as reported by the larger operations reporting detailed information, has increased in the 13-year period 1936-1948 from $22.81 to $69.56 per M bd. ft. (Table 1). This represents an increase of $46.75, or 205 percent. During the same period total labor cost, including direct and contract, has risen from $8.93 to $30.67, or 243 percent. In 1936 labor cost represented 39 percent of total cost, while in 1948, it increased to 44 percent. Materials and supplies in 1936 amounted to $2.63 per M accounting for 12 percent of total cost, while in 1948 these costs had advanced to $11.01 and were 16 percent of total cost. Materials and supplies have increased $8.38 per M, or 319 percent, during the 13-year period.

TABLE 1.—COMPARISON OF DEPARTMENTAL COSTS, SOUTHERN PINE INDUSTRY 1936—1948

Item	Cost per M board feet 1948	Cost per M board feet 1936	Increase in cost Amount	Increase in cost Percent
Logging and transportation	$21.673	$ 5.731	$15.942	278
Sawmill	11.449	2.660	8.789	330
Yards and sheds	3.573	1.036	2.537	238
Dry kiln	2.918	.689	2.235	327
Planer	4.600	1.425	3.175	223
Shipping	2.438	.811	1.627	201
Selling	2.856	1.346	1.510	112
General and administrative	7.705	2.994	4.711	157
Depreciation	2.005	1.356	.649	48
Stumpage and purchased logs	10.343	4.750	5.593	118
Total cost	$69.560	$22.812	$46.748	205

Industrial Engineers

Another very important and governing factor in this mechanical evolution in the lumber industry should be the employment of capable industrial engineers and designers, who can bring to each individual problem the force of skilled engineering experience. As an instance, industrial engineers can make surveys to determine how certain plants should be organized and operated. They can examine and observe the system by which men work. They can make time and motion analyses. They can study production records and investigate other activities, such as the planning and scheduling of the production operation itself, production methods, type of equipment, cost records, and how materials are received, loaded and shipped. On the basis of such studies these engineers can prepare recommendations on how management can step up its production, how employees' time can be better utilized, how machinery can operate more efficiently and to greater advantage, and how money may be spent judiciously in the conduct of the business.

Greater production, necessary to compensate for wage increases, must be attained through the use of more efficient production methods. There are three fundamental phases of lumber manufacturing processes, any one of which can reflect great savings through a well planned mechanized program. First—the woods operation—secondly, the saw and planing mill—and finally, the yarding, handling, and transportation of lumber.

Logging

Economical log handling is based on numerous considerations. Log sizes, nature of terrain, time element, and money are but a few. Logging is strenuous work and its conditions unavoidably handicap the productivity of men and machines. The introduction of mechanized logging in the South has been comparatively slow. Its judicious speeding up would reduce the cost of lumber production. Woods machinery and equipment are indispensible to present-day logging where power is required. Stepped up production and lowered costs come not from the use of power alone, but rather from the planned use of the right type and size of power, plus auxiliary equipment.

Tractor logging is comparatively young and while tractors and allied logging equipment have been used for years in the more heavily timbered areas of the South, these new methods are now taking hold in other sections where smaller timber is being harvested. Track type log trailers, cruisers, and arches lend themselves unusually well to selective logging practices. They are flexible in use and maneuverable in operation. Little or no advance road building is necessary, for the tractors can be equipped with bulldozers, permitting them to clear their own way. This type equipment was originally designed for large timber, but smaller tractor-and-arch, and tractor-and-trailer combinations offer equal advantages where small timber is to be handled. When longer hauls require greater traveling speed, the logging sulky serves the same purpose as the large arches or cruisers. This is especially true in small timber where lighter loads of small logs permit the use of pneumatic tires, adding to smoother performance of tractor logging. During the past few years many new mechanical log loading devices have been introduced to southern pine lumbermen. Some were developed by equipment manufacturers, and others by individual sawmill operators. Each has contributed in some way to more efficient and economical logging practices.

Portable power saws for felling and bucking present new opportunities for the logger. Increased mechanization on logging operations has been the chief reason why lumbermen have managed to maintain production. A large part of the credit can be attributed to the increased use of power saws.

Many improvements have been made in power chain saw equipment. The weight factor which was the principal objection to the earlier models has been reduced due to the employment of stronger and lighter materials. Logging crews operating power driven saws demonstrated that the

job of felling and bucking timber is increased in speed and efficiency many times. There may still be a divergence of opinion among lumbermen regarding the use of power sawing equipment, but recent demonstrations did much to prove that power saws are a big step toward lower logging costs.

A new day in tree planting is here. Mechanical trees planters are revolutionizing reforestation methods by planting at amazing rates. There is no other known method of planting seedlings comparable to these mechanical devices. Demonstrations have proved actual planting at the rate of 10,000 seedlings per eight-hour day. Until development of these planters, it was believed tree planting in rough woods could be done only by hand. Excessive bush, roots, and stumps interfered too greatly with mechanical operations. These obstacles now seem to have been overcome, giving promise of accelerating reforestation in the South.

Saw and Planing Mill

Although there were few fundamentally new developments in sawmill design during recent years, a number of refinements in the construction of band and circular saws, edgers, resaws, and trimmers have been made which resulted in an important cumulative effect in improving these machines. Similarly, planing mill machinery employing ball and roller bearings, direct motor drives, and improved steels, together with improvements in design, is capable of operating at much higher speeds than those of former years. Moreover, since electricity is more economical to produce and transmit than steam power, it is a prerequisite for the application of many refinements in practically all kinds of machines.

Inasmuch as improvements in saw and planing mills must be directed primarily toward the reduction of costs and increased production, both of which are necessary to compensate for wage and other increases, these changes should employ the use of the most efficient machinery and equipment. In some instances reduced cost and increased output can be obtained only through the use of more modern machines; in others, by simple fundamental adjustments in the existing equipment. Push button controls, automatic feeders, mechanical helps, and other means can be utilized in the interest of economy and efficiency. In some cases installation of these features in existing equipment may, of course, be impractical and prohibitive of cost, but intelligent observations will reveal many opportunities for improvement at slight cost and to considerable advantage.

No man should be used when a machine can be substituted, or an operation eliminated — provided that the depreciation, interest charges, upkeep and operating expenses of a piece of equipment or machinery are lower for a given period than the man's wages for a like period. Feed tables, sorters, pilers, unpilers, hoists, conveyors, and a myriad of materials handling equipment always offer good possibilities, and it is in the proper consideration of such machines and equipment that the alert millwright proves most valuable.

Handling and Transportation

Either automatic or semi-automatic sorting tables can be used very effectively in the handling of lumber. The semi-automatic type in which the sorter turns the lumber edgewise and drops it into the proper slot is less expensive and has advantages over the automatic type because in most cases the latter separates lumber by length only, rather than by width or thickness.

The use of mechanical stackers and unstackers for handling lumber to be either air or kiln dried also displaces a considerable amount of labor.

Tractors, straddle, and fork trucks can likewise greatly facilitate the handling of lumber because of the volume that can be moved.

Technological Developments

Some very striking cases of efficiency have been achieved since the Southern Pine Association adopted its program advocating greater mechanization. Many lumbermen have eliminated needless production delay, reduced total processing time, and saved labor by the appliance of more economical methods, which required better plant and woods equipment.

Greater sawlog utilization is the aim of most manufacturers today. This is accomplished in various ways, either by the use of new sawing methods which employ thinner gauge saws or through the installation of additional machinery used to process slabs, edgings, and trimmings. Much of this waste material formerly went to burners, but it now finds its way into many useful objects; such as mop and broom handles, fence material, toy and furniture stock, and surveyor stakes.

In one Arkansas mill, greater sawlog yield and higher percentage of upper grades are obtained by the skillful use of resaws and placement of the edger back in the remanufacturing plant instead of the sawmill. The latter is equipped with vertical and horizontal resaws for handling cants and heavy slabs. All lumber containing bark is first dried then edged, and the edgings are converted into mouldings, handle squares, toy and furniture stock. Although little manufacturing is done on the circular headrig, except breaking down the logs, this unit will be replaced by a band headsaw in order to reduce saw kerf at this stage of the operation.

Present types of equipment available for breaking down the log are few and comprise the large and small band mill, the circular mill, and of recent years the Swedish gang mill or round log gang saw. Although the latter method of sawing has been used extensively in other regions, the log gang mill has only recently been installed in a few pine operations in the South.

Gangsawing, requiring 5/32-inch or less kerf and providing a highly yield per man hour, will likely find its place in the southern pine region far above its present day use, according to lumbermen who have

employed this method of sawing. Higher overrun, greater productivity, and more uniformly sawn lumber are the principal features claimed for this type mill. Greater uniformity in thickness will permit thinner cutting, thus planer speed rate can be increased, and lighter machines required to dress the more uniformly cut lumber.

One lumberman using a small round log rig reported an average run of 18,000 feet per day for logs 6 to 14 inches in diameter, with an overrun of approximately 50 percent. Another lumberman producing 90 percent pine, and sawing 75 percent cant sawed logs 10 to 22 inches in diameter, practically all into 1-inch boards, is averaging 28,000 to 30,000 feet per day with an overrun as high as 70 percent over Doyle scale. This mill is operated by one deck man, one edgerman, one filer-sawyer, one carriage man, and two helpers, and powered by a 100 horse power electric motor.

Another operator sawing round logs only from 12 to 22 inches in diameter all going into 1-inch boards claimed he is averaging around 26,000 board feet per day with an overrun of 68 percent. This mill also required a 100 horse power electric motor.

Still another small log operation, cutting logs from 6 to 12 inches in diameter reported 18,500 to 20,000 board feet per day, overrun uncertain, but sawing about 435 logs per day. This operation required one filer, one sawyer, one carriage man, two edgermen, and two helpers. Maximum utilization is the objective and although using thinner gauge saws than other operations cited, the operator is unable to determine any appreciable difference in production. The thinner saws require less power, however, and he is using a 50 horse power motor instead of 100 horse power units required at the other operations.

The gang saw is designed for sawmills of various capacities and can be used for round log, cant, or resaw operations. It differs from the conventional band or circular mill in that the mass production system is applied. Thus, an essential part of a gang mill is in the sorting of logs to a size suiting the setup of saws which are set to accommodate the orders on hand.

Another new type mill, known as the Hydramagic Saw Mill, was placed into operation not long ago. This mill requires no blocksetter, no dogger, no log turner, and is controlled by a series of levers and foot pedals which are operated by the sawyer. No men are required on the carriage or the log end of the mill beyond the saw. One man is required on the log deck to keep the logs straight. The mill is producing 2,000 feet per hour and has been in operation about eighteen months and has given excellent service, cutting for grade only. It is claimed the setworks are accurate to 1/32 inch, and the mill will handle logs from 6 inches up to any size cut at this operation. The feed works are reported smoother than a 5-inch gun and somewhat faster.

The setworks are controlled entirely in front of the sawyer who sets a line and resets for his next cut while the carriage is being returned. As the log is being returned, the sawyer has ample time to set for the next cut, and as quickly as the log clears the saw, it is again set almost instantly. The blocks remain stationary while the setting takes place and remain so until released by another lever. This unit is hydraulically controlled from pressure provided by Vickers pumps which are operated from the mandrel, and maintain a uniform pressure of 600 pounds per square inch. The headrig is a circular 8- or 9-gauge solid-tooth saw.

A new type of variable speed, quick reversing carriage feed was introduced to the southern pine industry recently. Tested in a 50,000 board feet per 8-hour mill for eight months before its general release, the machine is claimed to operate at very low maintenance cost. The unit can be driven either by direct coupling to an electric motor, or by belting from a line shaft or other source of power.

Basically, the hydraulic power transmitter is of the multiple radialpiston type, where the piston fits in a revolving cylinder like spokes on a wheel. The heads of the pistons are in contact with a so-called "reaction ring," which, when moved off-center, cause the oil to be pumped. By varying the offcenter distance and direction, variable speeds in either direction are attained.

A logging transportation problem in a North Carolina operation was solved by a new method for transporting logs known as the "Skyhook." This is an aerial self-contained power driven carriage which travels on and is supported by two wire rope cables anchored at both ends. It obtains traction on two separate stationary wire ropes. The operator rides in the Skyhook carriage giving him control for traveling, lifting, or lowering the load, swinging, skidding, spotting, and yarding. The nominal rating of the machine is between 10 and 14 tons. Operating speed is up to 35 miles per hour.

Like little Topsy, many southern pine operations in the past "just growed." There are conspicuous exceptions today however, because lumbermen are seeking modern industrial engineering services before making major investments in capital equipment and plant improvements.

To cite a case in point, an east Texas company placed into operation recently a completely new power system which required the ingenuity of modern engineering skills. The engineers first made economic studies and drew up heat balances to insure the most economical plant, considering first cost, operating costs, and fuel supply. Boiler equipment guaranteed to produce 40,000 pounds of steam was purchased. Slightly over 20,000 pounds drives the generator which can produce 790 kilowatts. The remaining steam is used for other engines in the mill and for boiler auxiliaries. Normal operation requires only 35,000 pounds per hour of boiler output. This new boiler replaces three fire tube boilers at the dry kilns and two boilers at the planing mill and the

installation has resulted in a considerable savings in fuel alone.

Kiln Drying Technology

The tendency in kiln drying technology during recent years has been toward new developments that are not generally known to all lumbermen. In 1924 when the first cross circulation kilns were developed, they were 20 feet wide. Attempts were made to blow air up between the loads in the center of the kiln, but it was found that too much air was required to fill all the sticker spaces when they were on both sides of the rising column of air and obtain the necessary air movement in all of the spaces from bottom to top of the load. Later the air was sent up through the space between the kiln wall and side of the load. This required only half as much as when conducted in the center of the kiln where there were twice as many sticker spaces. However, during the past few years the fans have been placed overhead. Thus, it was found that as the circulation was increased, the temperatures required to maintain a satisfactory drying rate could be decreased. While this was an advantage, it was also discovered that as the volume of air was increased, difficulty was encountered due to the lack of space between the sides of the load and walls of the kiln. It became necessary to increase this space until it now approaches 4 feet which necessitates a kiln 26 feet wide or greater.

Therefore, the present tendency is to increase kiln capacity by adding tracks rather than increase circulation or temperature. In order to fill all the sticker spaces, 18,000 cubic feet of air per minute for each 8 feet of kiln length are required to maintain the 250 feet per minute rate of circulation through all the sticker spaces. Thus within the next few years kiln may contain three and even four lines of tracks each.

Conclusions

The trend toward greater mechanical efficiency in the southern pine industry has attracted the attention of sawmill and woods machinery and equipment manufacturers who have in many instances introduced new production methods and techniques which have proved valuable. Lumbermen have almost universally relied upon manufacturers of sawmill machinery to provide the kind of equipment which they thought would be best adapted for the erection of a sawmill, dependent upon the amount of money to be invested, and to some extent the character of timber to be sawed. Much credit must be given to the manufacturers of sawmill and woods machinery, as well as producers of engines, boilers, and other allied equipment, for the interest which they have taken in the lumber industry, and the conscientious study which they have made to provide the best equipment for particular needs.

The fact remains, however, that the manufacturers of lumber processing machinery have worked along the lines of their own personal theories, and while they obviously try to provide the kind of equipment which will produce the best results they have been limited in the developments of their business, and the character of their investigations, by the necessities of the lumber industry itself.

The importance of having skilled and competent workmen to produce quality products is not minimized; but the attainment of the highest manufacturing efficiency is seen to depend largely on having, in the first place, perfectly adapted machines and equipment of the best quality obtainable, and, in the second, on the steady utilization of this equipment up to the limit of its effectiveness. Mechanization thus very largely determines costs in a mill which aims at quantity as well as quality of output, and no effort should be spared to get the most effective use out of all types of labor-saving devices as well as the primary processing machinery.

With higher labor and material costs, higher taxes, and various other outlays, it is quite necessary that new and better ways be developed to produce good lumber cheaper. Thus, we find manufacturers constantly looking for new ideas and methods to increase production, and reduce costs, such as economical plant layouts, material handling, high productive methods, incentive systems, or whatever can be found to increase production, and reduce costs in general. Some of the short cuts to greater efficiency worthwhile looking into include:

1.—More economical plant layouts.

2.—Extensive use of mechanical handling equipment.

3.—Employment of better sawing methods.

4.—More efficient power generation and transmission.

5.—Improved lumber drying techniques.

6.—Elimination of unsafe working conditions.

CITIES WITH A FUTU

This is Klamath Falls with an area population of about 25,000. It is 293 miles south of Portland; 383 miles north of San Francisco.

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Nearly a million acres of fine Ponderosa pine timberlands are in the Klamath Falls area. This, plus agriculture, is the basic resource that supports the city's industries.

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An example is the Weyerhaeuser operation in this area. It is backed by the Klamath Falls tree farm, where modern selection harvesting has long been practiced. The plant includes a sawmill, dry kilns, planing mill, Pres-to-log plant, box shook factory and power plant—providing whole crop utilization. Additional wood processing facilities are in the plans stage. Company property was recently made available to another organization for experimental production of naval stores from pine stumps.

Klamath Falls is growing steadily—a city with a future!

WEYERHAEUSER
SALES COMPANY
ST. PAUL, MINNESOTA

Seeding of Forest Land from the Air[1]

G. H. Schroeder
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As the result of repeated fires, more than two million acres of forest land in the Douglas-fir region are non-stocked or in need of additional stocking (*1*). With an annual average nursery production of forest planting stock of around 20 million seedlings (*3*) the job of planting this area would take at least 20 to 30 years if no planting was done on currently and recently logged areas. Since planting *is* being done on recent cut-overs, it seems safe to assume that planting of all forest land needing stocking in this region would entail a job extending over at least half a century. At the present cost of some $20 an acre such a project would entail expenditures far beyond the financial ability of the landowners involved, unless spread over some such period of time.

Many forest land administrators have tried to work out a less expensive and faster means of getting the job done. Direct seeding, especially from the air by conventional plane and by helicopter, has received more and more study.

Direct seeding has been used with some good results in European countries, but its use in the United States has generally been, with a few exceptions, very discouraging. In spite of past experience, foresters over the years have continued to study direct seeding possibilities in the hope that advances in knowledge would make its use feasible.

Advantages of Direct Seeding

Direct seeding is much cheaper than planting. When used with aircraft fitted with proper seed hoppers and seed disseminating apparatus, it becomes *a very fast and flexible method* of reforestation. Several acres per minute, 200 or more acres an hour, or 1,500 to 2,000 acres per day can be seeded by one air machine with uniform distribution of tree seed. Estimates lower than $1 per acre, exclusive of seed costs, are now being given by responsible companies. Tree seed on a basis of 30,000 to 40,000 viable seed per acre for the small, and somewhat less for the large-seeded species, will cost from $2 to $10 per acre, depending on cost per pound and species used. Total costs, therefore, may be from $3 to $11 or more per acre. Planting of seedlings can easily be from three to seven times as costly as aerial seeding on the same area and requires expensive capital investments in nurseries.

Probably more important, or just as important as cost, are the items of speed and flexibility. With effective aerial seeding the entire area needing reforestation may be put back into production within a very short time and all cut-over area can be kept in production without a lapse of time due to poor seed years or pressure of rodent populations. Some 15,000 to 20,000 acres are included in the experimental helicopter work in the Douglas-fir region this year. Interest is growing and the yearly rate of seeding forest land will undoubtedly increase rapidly. Planting, moreover, is very difficult in the more inaccessible areas, whereas aerial seeding is a relatively simple operation on almost all the acreage involved.

Hazards

Probably no forester involved in direct seeding work would have the temerity to claim that it holds all the answers to reforestation problems. Aerial seeding, at best, is merely another reforestation tool which, with intelligent use, may contribute materially to the "greening up" of our non-stocked and poorly-stocked forest land. Hazards may be listed as adverse weather, rodent depredations, and unfavorable growing sites.

Weather is a hazard in several ways: As it affects flying the area; as it affects rodent control operations; and, most important of all, as it influences germination of seed and the survival and growth. Proper seed placement requires a uniformly slow flying speed at a fairly constant height above the surface of the ground with a flight pattern that covers all the area. Weather, especially wind, may make such specifications impossible of attainment. Rain may render rodent control operations valueless due to the use of water soluble poison. Heat and drought are very serious, since the survival of seedlings in all but the most favorable locations may be made impossible by critical temperatures. Drought will always be a reason for death of some seedlings and in some locations may preclude restocking by aerial seeding in all but the most favorable years.

Research over the past twenty years on the seed-eating mammals of the Pacific States (shrews and mice) has conclusively shown they are very important in forest regeneration in this region (*2, 4*). One white-footed mouse will consume more than 200 Douglas-fir seeds per day if other food is lacking (*5*). In terms of one winter's consumption that amounts to about one pound of Douglas-fir seed during the period of time seed is on the ground before it has germinated. Moreover, considerable seed above the rodents' needs may be collected and buried. Since trapping by the U. S. Fish and Wildlife Service and by others has established that there may be as many as fifteen or twenty mice per acre on non-stocked cut-overs, it is easily seen that *rodent control is a must* (*2*).

Unfavorable sites due to competition from vegetative cover, exposure and soil conditions may be seeded, or if the risk is calculated and considered too great, avoided entirely. Herbaceous vegetation may be beneficial in that it furnishes shade to eliminate critical temperatures, checks erosion, and holds moisture. Eventually, how-

[1] Presented at the annual meeting, Society of American Foresters, Seattle, Wash., October 11, 1949.

ever, it will usually build up a mat of material through which it is impossible for seed to work its way to mineral soil and very difficult for the rootlets of the seedlings to penetrate. Various shrubs also furnish competition and may take over the area in such a manner that reforestation is very difficult. The annual leaf-fall may flatten and smother the tiny trees.

Exposure to direct sunlight on south and west slopes results in high temperatures and low moisture content of the soil. In western Oregon and Washington, therefore, such slopes are often difficult to seed unless shaded and abnormally moist. The more nearly the slope of the ground is at right angles to the sun's rays during the heat of the day the more difficult the site; slopes exposed to prevailing winds may be drier and more difficult than those not so exposed and east slopes may be unfavorable because of killing by early morning sun in frost critical areas.

Soil conditions may make an area unfavorable for direct seeding. For instance, the first year after a heavy burn the color of the soil may be so dark that heat absorbed will raise the temperature to the critical point. Also, areas of heavy soil erosion may be poor risks because seedlings may be torn out or covered up. Other considerations may tip the balance for or against aerial seeding. In the final analysis, the decision must be made by the forester in charge after weighing carefully all the considerations.

Administering the Project

In choosing an area or areas for aerial seeding, there are several administrative considerations. *Size* is important, since the larger the area the less expensive will be the unit flying costs, other things being equal. Many small areas close together may constitute a feasible project; several medium-sized acreages may be inexpensive to treat; and one large project is, of course, the least expensive. Shape is also important, since irregular areas are more difficult, their boundaries are hard to mark, and are more costly to fly. Favorable exposures should require less seed, and topography will affect the evenness of seed and bait dissemination since the tendency is to fly at a constant elevation. Vegetation may require the use of pellets instead of bare seed, the greater weight of the pellets being necessary to make certain that seed does not "hang up" before reaching the ground surface. Tests with pellets of western tree seed show that germination is not inhibited by the pellet coat, and their greater weight (17 to 1 with western hemlock) aids greatly in penetration of vegetative cover. If vegetation and shade is insufficient on areas recently burned it may not be feasible to seed until one growing season or more has built up live shade to reduce surface temperatures and increase moisture in the upper soil surface, while at the other extreme it may be necessary to burn accumulations of dead materials a year or so beforehand in order to have a suitable seed bed when the aerial seeding is done. Where burning is out of the question, an area with extremely heavy vegetation may have to be ruled out entirely; however, salvage logging if possible in such areas—inasmuch as it results in the tearing up of the cover and exposes a maximum of mineral soil—is beneficial.

After an area has been studied and chosen for aerial seeding, one of the first and most important tasks is that of estimating rodent populations. There is no known method of measuring the exact rodent population, but two methods for estimating mouse pressure have proved satisfactory. In the first method a grid is made in a representative area, with a trap located at intersections of the grid lines. A variation of this method is trapping in lines placed at random on the theory that a much larger area can be sampled in the same time thus giving a better index to population.

In the second method, bare spots are kicked with the boot and about 50 kernels of grain or tree seed placed in a line therein. These spots should be studied within 24 hours and if the acceptance is very low, the spots should be observed again at the end of three days. Lines of acceptance spots should be placed in a wide variety of cover to sample adequately the area to be seeded.

It is possible, by either method to estimate whether a material number of rodents is present and if control is necessary. Also, by duplicating the procedure after baiting, it is possible to estimate the effectiveness of the bait.

Acceptance bait may be oats, barley, wheat, or forest tree seed itself (oats and Douglas-fir seed preferred). Rodent tastes vary, however, according to the area, and one bait may be well taken in one area while refused in another. In general, the white-footed mouse (which causes by far the greatest damage) shows great adaptability in eating habits. It may be necessary, therefore, to become familiar with the food tastes of rodents in each area in order to estimate efficiently the pressure of their numbers. Rodent control is generally admitted to be absolutely prerequisite to success of direct seeding. Control by baiting from the air seems the only feasible means for large areas since it is far less costly, can be done in a minimum of time, and involves almost no danger due to handling of bait by human hands.

Fixed-Wing Plane vs. Helicopter

Although initial work in aerial seeding was done with fixed-wing aircraft, it seems generally agreed at this time that use of the helicopter has several advantages, namely:

1.—It produces a more even dissemination of bait and/or seed. This is so because: (a) it can maintain a uniformly constant and slow flight speed above the ground; (b) the height above the ground can be fairly well maintained regardless of broken topography; and (c) uniform swath width is no problem.

2.—Helicopter operation at slow speeds above rough ground where snags are common is not nearly as hazardous as the conventional plane.

3.—Much time is saved on the job since the helicopter can be set down and its hoppers filled on the project area, eliminating flying time to and from a flight strip.

Rodent Control on Areas with Seed Source

Where there is adequate seed source on the project area and a seed crop occurs the year the work is done, rodent control is the only consideration. Actually such control is probably the only work needed on many of the non-stocked and partially-stocked areas in the region. Foresters planning reforestation programs, therefore, should have every non-stocked or poorly-stocked area with seed source in mind for rodent baiting in any year that seed is disseminated in appreciable quantities. Aerial seeding on such areas would be absurd since the quantity furnished by even a poor seed source could easily exceed that used in artificial seeding.

Seed for the Project

Where seed source is absent, seed as well as rodent bait must be sown. The source of the seed is of the utmost importance and every effort should be made to obtain seed from a climate and soil comparable to that where it is to be sown. Although initial successes [6, 8] in direct seeding were largely with larger-seeded species such as Douglas-fir and the pines, small-seeded species seem very favorable for use because: (1) The same number of viable seed will usually cost less, and (2) rodents are less likely to find the seed sown.

A mixture of species seems the most desirable since conditions react differently on different species. Rodents seem to prefer one species in one area and a different species in another. Failure of one species, moreover, is not so disastrous if other species grow, and a mixed forest is less liable to loss from insect or disease attack.

Seed should be free of foreign matter to insure a smooth flow from the hoppers.

Marking the Area

The best planimetric map showing all identifying local features should be furnished the pilot for study. Someone familiar with the project areas should fly with him to point out the local landmarks on the map, and the areas must be well marked on the ground. Squares of tar paper, with orange squares painted in the center, tacked to the sides and tops of large stumps or trees, or weighted down with heavy objects on open slopes are very good markers. They should be visible from a distance as well as from directly overhead. One marker per quarter mile and at each corner of the seeding area is desirable. Guide flags on a prominent ridge located equidistant apart aid in the maintenance of uniform swath width. Such flags may be taken down as the helicopter goes over them. A pick-up truck on a road, stopping at premarked equidistant points will serve the same purpose.

Buffer Strips

Where rodents are found adjacent to a seeding area it may prove desirable to treat a strip around it to take care of migration. Condition of adjacent areas and rodent population pressure will have to guide the forester in this decision. Where food is plentiful and population low, rodents are not likely to travel far enough to endanger seeding. If population is high and food supplies low, a buffer strip up to a quarter mile in width may prove a good investment.

Measuring Results

Before the helicopter starts a given project the dissemination device should be tested both by output from spreader tubes while on the ground and by careful measurement of width of strip and grains of bait or forest seed per milacre. The end of a black-topped airport runway furnishes an ideal place for such a check. Head phones connected to a sounding wire in the spreader tubes should be used by the pilot so he will know when the flow of seed stops for any reason.

The use of cleared, bare ground milacre circles or squares, prepared before the helicopter work with the corners or centers marked with nails or wooden pegs so as not to be visible from the air, allows proper check of dissemination. The use of bare soil appears necessary since experience shows that pilots will change their flight either knowingly or otherwise to hit visible plots.

Measurement of results on large areas is a problem for the first several years. Seedlings are so tiny and so easily hidden by vegetation and brush that sufficient time for measuring results in order to have statistically accurate data is rarely available. An indication, however, of germination and first year survival should certainly be obtained by sampling to the intensity allowed by time available. Results must be known in order that proper procedure can be developed.

The difficulty of finding seedlings is clearly shown by data from a hand seeded area which contained a mixture of Port Orford cedar far from a seed source of that species. The germination count the first year showed 200 Port Orford cedar seedlings per acre, the survival check a year later showed 460 seedlings per acre and a survival check four years after seeding resulted in a figure of 900 seedlings per acre. Some of this difference is undoubtedly due to delayed germination, but many of the seedlings were probably not found on the early checks.

Experience indicates that only after several years are fool-proof figures on results of direct seeding of a given area obtainable.

Rodent Control Baits

Some early attempts at direct seeding were successful, but it appears such was the case only when rodents were nonexistent. Recent information seems to indicate that one reason for the large percentage of failures was the use of an ineffective rodent control agent. Strychnine bait, at one time the only common rodenticide, for some reason is not effective in the con-

trol of the white-footed mouse. A few mice are killed, but more merely become sick and avoid the bait from then on.

Use of thallium sulphate during the last two decades has gained favor since it is readily taken, is relatively insoluble in water and is much more effective. According to cage tests (*1*) from four to seven seeds, or kernels of thallium wheat, prepared according to the formula developed by A. W. Moore of the U. S. Fish and Wildlife Service, are necessary to kill a mouse. Since the thallium bait is slow to act, a mouse can easily ingest a lethal dose before feeling the effects of it. There is always the possibility, however, that it will not get a lethal dose before becoming sick, in which case it probably will not eat any more bait and will continue to be a consumer of tree seed.

Sodium fluoroacetate, or Compound 1080, as it is more commonly known, can be carried in wheat to the extent that one kernel, or portion of a kernel, is sufficient to kill a mouse. Since it is water soluble, it leaches out quickly and is not a menace to bird or animal life after the first heavy rain. Baiting is done as late in the season as it is possible to be sure of dry weather. At this time, summer bird visitors have left, but to make doubly sure that birds are not poisoned, the bait is colored green. Since mice feed by night and find food by smell instead of by sight, as birds do, they are not protected by the artificial coloring. In fact, mice seem to take 1080 wheat more readily than untreated wheat. It appears to be the ideal rodent control agent, and has been used with what appears to be complete success on projects in the Douglas-fir region. The amount used per acre should be varied according to the rodent population, but 1/4 pound of 1080 wheat at a cost of 25 cents per acre or less should be entirely adequate.

Results So Far

During the few years of experimentation in direct seeding carried on since the end of the last war, definite progress appears to have been made. Two large companies and the Oregon State Forestry Department have projects behind them on which all tests show effective rodent control. At least two companies owning helicopters have developed machinery and procedures for accurate dissemination of seed and/or bait over rough and very difficult seeding areas. The State Forestry Department has carefully studied results on experiments carried on and has published data (*8*) on one of the seeding experiments that shew an average stocking on the entire area of 335 trees per acre, and on favorable exposures and ground conditions, of up to 1,500 trees per acre. Although private companies are loathe to publish figures because of the necessary inadequacy of sampling from a statistical standpoint, it is known that aerial seeding has given good stocking in favorable portions of several of the areas seeded.

Aerial baiting and/or seeding is not regarded as the final answer to all reforestation problems, but it is rapdily developing into a useful tool for bringing favorable sites back into production, especially on inaccessible areas where planting is out of the question. Used judiciously in conjunction with planting, it should allow the Pacific Coast to reforest in one-half the time or less the great area of nonstocked or partially-stocked forest land now needing attention.

Full stocking on all areas within a given project will seldom be obtained. Some projects will be failures because of poor rodent control or because they are too tough for methods used. Planting will undoubtedly have to be used to finish the reforestation job on many aerial-seeded areas, but the cost of stocking should compare very favorably with costs of planting trees.

Where the job of reforesting the nonstocked and poorly-stocked lands in the Douglas-fir region by planting alone appears almost impossible of attainment in the foreseeable future, it may be entirely possible in a relatively short period if aerial baiting and/or seeding is used on favorable sites. Foresters can hardly afford not to use helicopter rodent control on large inadequately stocked areas that have a seed source. If there is no seed source, but a balance of mineral soil, shade, ground moisture, and other favorable conditions, an investment of $2 to $10 per acre for high quality seed may be in order.

Literature Cited

1. ANDREWS, H. J. and R. W. COWLIN. 1940. Forest resources of the Douglas fir region. U. S. Dept. Agric. Misc. Pub. 389.
2. ISAAC, LEO. A. 1943. Reproductive habits of Douglas fir. Chas. Lathrop Pack Forestry Foundation, Wash., D. C.
3. KUMMEL, J. F., C. A. RINDT, and T. T. MUNGER. 1944. Forest planting in the Douglas fir region. U. S. Dept. Agric.
4. MOORE, A. W. 1940. Wild animal damage to seed and seedlings on cut over Douglas fir lands of Oregon and Washington. U. S. Dept. Agric. Tech. Bul. 706.
5. OAK EWING, ALAN LINDSAY. 1948. Repellent treatment on Douglas fir seed and other subsidiary studies in relation to interference by seed eaters on direct seeding. A thesis.
6. SCHOPMEYER, C. S. and A. E. HELMERS. 1947. Seeding as a means of reforestation in the Northern Rocky Mountain Region. U. S. Dept. Agric. Cir. 772.
7. TOUMEY, J. W. and C. F. KORSTIAN. 1931. Seeding and planting in the practice of forestry. John Wiley and Sons, New York.
8. WOODS, JOHN B., JR. and JOHN H. HANN. 1949. The Cochran airplane seeding experiment. Oregon State Board of Forestry, Salem.

Preliminary Report of Subcommittee on Planning and Statistical Procedures of Committee on Technical Procedures and Standards for Silvicultural Research and Research Publications[1]

Planning Silvicultural Research

Good planning is doing and redoing in a variety of ways in the imagination what is later to be done in fact, until the most suitable course of action is decided upon. Imagination is an important part of planning, and since it builds on the familiar and rearranges in new ways what we already know, the best planners are those most familiar with their subject and with the techniques for handling it.

The written plan sets down the conclusions reached in the process of planning. To be convincing it may have to describe some of the methods that were imagined and discarded, and tell why they were discarded, but it can never record all that went on in the planner's mind. Therefore, things are likely to go best if the planner and the doer are the same man. That cannot always be, especially in silvicultural research where courses of action may be projected that will outrun the life span of the investigator. In such research, written plans are of highest importance.

The jobs to be done ahead in imagination, and later in reality in silvicultural research can be listed about as follows: deciding what to do; deciding how to do it; writing down these decisions; doing the job; writing down what was done, and what needs to be done; continuing the work and the recording; analyzing the data; and publishing the results.

There is some question where the work of research ends. Another job which, whoever does it, must influence the course of action decided upon by the research man might be added. It is: taking the action indicated, i.e., putting the results into practice.

Almost every one of the jobs listed requires the use of language. They are jobs of thinking or of writing. In only a few are trees, logs, diameter tapes, cameras, and surveying instruments handled. In all the other steps we *talk* about them.

Wendell Johnson says in his book, *People in Quandaries* (Harper, 1946):

> . . . . the general method of science, stripped of its technicalities, lies in (a) asking questions that can be answered on the basis of observations, (b) making the relevant observation, or using those made by others, (c) reporting the observations accurately so as to answer the questions asked, and (d) revising conclusions previously held in accordance with the answers obtained—and asking further questions that are prompted by the new conclusions. Now, aside from the making of observations, this is seen to be a method of using language.

It follows that good planning and good research work require skill in the use of language.

Planning is not finished when the plan has been written, but is involved in all the other jobs. Each step in the execution of research brings a new point of view and requires adjustment and replanning. So planning goes along with research, interwoven with it, until the results are in print and even until the newly discovered method is put into practice.

In considering how putting research results into practice may affect planning, we should remember that usefulness of results is the only justification for research. "The object of taking data is to provide a basis for action," says W. Edwards Deming in *Statistical Adjustment of Data* (Wiley, 1943). This does not mean all research must have immediately practical results, for much research is valuable because it provides a broader and firmer base for further research. But to plan research without knowing what the results will be good for is like shooting without knowing what the target is.

Our discussion of planning can be broken down into four subjects to follow: deciding what to do in silvicultural research; deciding how to do it; writing down the decisions; and following through.

Deciding what to do.—The job of deciding what to do in silvicultural research can be conveniently thought of in two stages: breaking down the field of endeavor into manageable tasks, or studies; and choosing the ones to be done first. Together these two stages make up what is sometimes called a problem (or a project) analysis.

Before proceeding we ought to consider what we mean by "studies" in silvicultural research. This ultimate subdivision of research work is not easy to define because it may vary with different research organizations as their finances, manpower, and research administration methods vary. The results of a study, as we use the term here, can be presented as a single, complete, independent report. The planning and initiation of a study can be, and most often is, the responsibility of one man who will generally also carry it through, analyze the data, and report the results, unless the reactions being observed take too long. The termination of a study is definitely set—if not in months or years, then, perhaps, in timber rotations. Likewise, a study is distinctly limited in space—to the loblolly pine type of the Carolinas, say, or even to the pure 30-year-old old-field stands of loblolly on a certain experimental forest. In summary, a study is a unit of silvicultural research so limited in time, place, and subject matter that the data collected under it may be analyzed as a unit and presented in a single report.

If you are the director of one of the regional forest experiment stations, your field of endeavor to be broken down into silvicultural studies will cover all the phases of the subject in perhaps a half-dozen states. If you are in charge of work at a branch station, your field will be more limited geographically. If you are teaching mensuration at a state university, it will also be limited as to subject matter. If you are a graduate student

[1] Presented at a meeting of the Division of Silviculture, Society of American Foresters, Seattle, Wash., October 12, 1949.

majoring in forest ecology and specializing in the effect of fire on forest succession in lodgepole pine in the Rocky Mountains, your study may be decided upon to begin with. The size of the job of getting down to manageable research tasks, and whether a full-fledged problem analysis is needed, will depend on how wide a choice in the field of silviculture you have in the first place.

Wherever we start, the pattern is the same: silvicultural research can be broken down subject-matter-wise, geographically, and by type or by species. The subject matter subdivisions of silviculture are fairly well standardized: the fundamental phases—silvics and ecology; the applied phases—systems of natural regeneration, intermediate cuttings, and seeding and planting; the business phases—forest management, regulation, and mensuration. Each phase can be further subdivided. Many schemes are available, among them that proposed in a classification of forestry literature by a Society of American Foresters' committee headed by Korstian (Jour. Forestry 21: 148-161, 1923), that contained in *A National Program of Forest Research*, prepared by Clapp and published by the American Tree Association and the Society of American Foresters in 1926, those used in the filing schemes at forest experiment stations, and the ones suggested by the chapter and section headings in text books on silviculture. No strict standardization of subject classification is possible, for each case will have its own peculiar requirements. Within many of the subject classifications there may need to be studies to test the biological validity of some treatment of the forest, studies to test the economic feasibility of the biologically valid treatments, and studies to test the integration of the silvicultural treatment with other uses of the forest—watershed management, range or wildlife management, or recreation. Subdivision geographically may be by state, county, or other political boundaries, or by watersheds or vegetative types. Subdivision by species follows as the next natural breakdown.

The ultimate breakdown should be fine enough so that a single objective is isolated, and so that as the next step the specific details of doing the research can be taken up. The effect of forest litter on the natural regeneration of loblolly pine in old-field stands in North Carolina might be one of the forty or one hundred ultimate studies composing silvicultural research in the Southeast. The cost of prescribed burning used to encourage reproduction in these stands in relation to the financial gains it brings about might be another; and the relation of such prescribed burning to erosion might be a third.

Having divided the silvicultural research field into studies, we must next decide on priorities. To do so we must ask: what may be done; what ought to be done; what can be done; and finally, if there is any choice left, what would we like to do.

The first job in priority assignments is to find out what research has already been done in order to learn which studies would duplicate conclusive research already finished and available. When these have been eliminated from the list there remain the studies proper to pursue because results from them will increase silvicultural knowledge. They constitute the work that *may* be done.

What studies *ought* to be made first? Those for which there is the greatest practical urgency; those which will fill the critical gaps in our silvicultural knowledge; those which will lay the broadest base for application and for additional useful research: any one of these criteria or a combination of them can be used to line up the studies in the order in which it would be desirable to attack them.

But funds, equipment, personnel, and the aptitudes and abilities of personnel will be limited. These limitations will determine what studies *can* be undertaken.

Finally, if there are a number of studies that can be done, high on the list of those that ought to be done, choose the one that you like best. It is likely to be the one you can handle best.

Deciding how to do it.—A study has at its core some question, some unsolved difficulty. The ferreting out and clear statement of this essential question is the beginning of its solution. In *An Introduction to Logic and the Scientific Method* (Harcourt-Brace, 1934), Cohen and Nagel say: "In order to state some obscurely felt difficulty in the form of a determinate problem, we must be able to *pick out*, on the basis of *previous knowledge*, certain elements in the subject matter as significant." This emphasizes again the importance of a thorough grounding in subject matter.

To help to answer the question "How can old-growth ponderosa pine stands in the Boise Basin be cut so as to produce high yields of usable timber continuously?", any number of hypotheses could be set up, but to be useful they must be verifiable and relevant. Previous knowledge must be used in deciding which are worth while. Ponderosa pine trees grow group-wise. The selection for cutting of trees by maturity classes alone, often removes whole groups and leaves other over-dense groups untouched. The hypothesis can be set up that taking some of the cut from the over-dense groups will stimulate growth more than marking strictly by maturity classes. This is evidently a relevant hypothesis and can be tested by cutting some areas one way, some the other, and comparing the results. There will certainly be other worth-while hypotheses. The preservation of advanced reproduction of pine is essential to the orderly progress of age classes in the selection-system method of handling ponderosa. The use of large tractors in logging is destructive to young pine trees; horses and small caterpillar tractors do less damage. The hypothesis can be tested that horses and small tractors can be used profitably in logging ponderosa pine.

Whenever possible, hypotheses should be chosen that will, if verified, provide the widest base for application and further experimentation. This point was made before when we were discussing study priorities. It needs to be emphasized. We should seek research results in silviculture that can be separated from the forest stands where they were obtained and used elsewhere. If we measure the integrated effect only of light, moisture, and temperature on stand growth, we shall be restricted in the use of our results to stands like those we studied. If, on the other hand, we can determine the individual effects of these factors, we shall not be so restricted. Furthermore, our results will strengthen a larger number of other experiments, and be basic to a greater number of new ones.

Actually, no fixed rules can be given for selecting the most relevant hypotheses to be tested. But it is always helpful to find out how others have handled similar studies—how they formulated the problems and what techniques they used in the solutions. This assistance should never be neglected. A general background of the philosophy of experimentation is also very much worth while. Probably the Cohen and Nagel text already referred to is as good a beginning as any.

The proper framing of the question to be answered and of the hypothesis to be tested in seeking the answer will imply the nature and extent of the population to be investigated, the variables to be considered, whether treatments are to be imposed and, if so, what they are. These items should be elaborated in the plan for the research.

The extent of the population must be decided upon so that observations can be confined to it and so that provision can be made for a sufficient sampling of it in cases where the whole population cannot be observed. The variables to be considered must be defined and methods and instruments for measuring them decided upon. Careful definition of treatments is especially important in silvicultural experiments. If they are not defined so that they can be repeated exactly, the whole value of the study is lost. For if a poorly defined treatment turns out well you cannot tell others how to repeat it; if ill, how to avoid it. It is impossible to reconstruct such a treatment 10, 20, or 30 years after it was applied.

Another outcome of the long-time nature of silvicultural research is the need to make provision for outwitting the tricks of time and change. Sample plots must be marked so that they can be relocated accurately and definitely by whoever has to remeasure them. The methods decided upon should be described in the plan.

Because measurements are subject to error and because living things are affected by many factors that cannot be evaluated or controlled, no silvicultural questions can be answered absolutely—but only with more or less reliability. Calculation of this reliability is the function of statistical methods treated in another section of this report. Here it should be noted that the plan must provide for the replication of observations and treatments, the taking of efficient samples, and the use of methods of analysis that will provide valid estimates of the reliability of results.

Finally, the way in which the results expected from the study are to be presented should be considered. A good way to begin a study is to outline the publication that may result from it. Charts and graphs that will be needed should be projected. In this way, essential things, perhaps impossible to retrieve if forgotten until the end of the study, can be planned for, and unnecessary details left out.

Writing down the decisions.—The written plan for silvicultural research serves three purposes. It forces the research man to organize his ideas; it is a means of continuity for long-term studies; and it is a preparation for the publication that will come from the study. Any one of these would make the writing of the plan worth while. Taken together they make it indispensable.

The planning that went into deciding what to do, when written down, yields the problem analysis; the decisions on how to do the work become the study working plan.

The outline for the problem analysis should include all the information necessary to support the delimiting of studies and the assignment of priorities. This will involve, on the one hand, a description of the territory involved and the problems in silviculture it presents, and, on the other, a review and evaluation of silviculture research work already done.

The study working plan will include the following items:

1. A clear, precise, specific statement of the questions to be answered.

2. A review of the literature for the purpose of limiting the study and of getting hints on procedures and techniques.

3. A statement of the hypotheses to be tested.

4. Details of the method to be used—the experimental design, where plots are to be located and when established, definition of treatments to be applied, measurements to be made, instruments to be used, forms for recording data, methods for analyzing them, etc.

5. Method of presentation of the results.

6. Personnel, duration of work, cost, etc.

In the writing of the plan the rule for all good writing should be followed: Be sure what you want to say; say it so others can understand it.

Following through.—Planning research and doing it are interwoven. The written plan will need revision as treatments are applied and first measurements made. Unexpected things will happen. Better techniques will occur to the worker. These should be taken into account in planning for continuation of the study.

Each step in the study should be written up. An establishment report should explain when and how the first work was actually done, how it differed from the plan, and should outline the work yet to be

done. Alternate doing and planning will follow through the whole study until the results are finally in print.

Even then planning should continue—to get the results into practice, and to carry on further studies suggested by those completed. Thus, planning facilitates the improvement of silvicultural skills and the advancement of forest-management practices. By the application of foresight to silvicultural research, planning makes research more efficient, the results more useful, and the whole job more worth while and satisfying.

Statistical Methods in Silvicultural Research

Why statistical methods are needed.—If there could be one and only one answer to the question what is the diameter of that tree, and if a definite percent, no more, no less, of every lot of yellow-poplar seed were viable; in other words, if measurements were not subject to error and living things to unaccountable variation, there would be no need for statistical methods. But measurements are subject to error and living organisms do vary even under controlled conditions.

Experimental results are, therefore, not absolute but variable; and so the basis for action they provide cannot be absolute or perfect; it is only more or less reliable. The evaluation of the reliability of experimental results is a function of statistical methods, along with the designing of efficient experiments and the skillful analysis and condensation of experimental results. Statistical methods are, however, not the whole of silvicultural research, or of any other kind of research. They are only an aid to, and not a substitute for, the right use of human reasoning power.

A model of variability.—Just as mathematical models—paraboloids, cones, neiloids—are used to help in the calculation of the volume of tree trunks, so mathematical models have been set up to help in dealing with errors of measurement and the uncontrolled variation in living things. One such useful model is the "normal curve of error." Although we have not yet found ways to make trees grow more like paraboloids, or neiloids, we can make the variability of our forestry data approach the normal curve of error by properly collecting and handling such data. For example, treat the several thousand planted trees in a uniform plot alike. Measure the heights of 30 of them. The heights will vary and the pattern of variation may look little like the normal curve. Take heights of 30 groups of 30 trees each. The 30 averages of the groups will vary, but the pattern will be closer to the normal curve of error than the 30 single measurements. The fact that the variability associated with our data fits the mathematical model better and better as the number of observations increases, strengthens our confidence in the model.

The normal curve of error is based on the laws of chance. If we are to make use of the formulae derived from it we must be sure that every one of the trees in our uniform plot had an equal chance of being selected for measurement in our samples, that is, they must have been chosen at random. This seems sensible, too, for we are well aware that if we picked tall trees only, we would get a biased average, no "honest" answer to the question: How well are the trees growing on that plot?

Over and above these and other evidences that the mathematical model set up by the statisticians does really fit the kind of variability we deal with in biological research, use of statistical methods has the great advantage that it compresses and distills, by standard procedure, masses of data that would be unmanageable in the raw. Condensation of data in a variety of ways, each research man using his own, would be confusing and inefficient—just as it would if each one used a language of his own. The accepted "language" not only of biological research, but of science in general is statistical methods. Workers in silvicultural research cannot afford to be unfamiliar with it.

Some statistical procedures useful in silvicultural research.—It is not the purpose of the committee to teach the use of statistical methods, but rather to tell why this tool is needed and to point out situations in which it is useful.

Consider now an experiment to determine the effect that the addition of organic matter to the soil has on the height of nursery seedlings at transplanting time. The average height of seedlings in the humus-treated bed is found to be greater—say 3 inches greater—than the average height of seedlings in the untreated bed. But the best seedlings in the untreated bed are taller than the poorest ones in the treated bed. How reliable is this 3-inch difference in the averages? Statistical methods provide a standard test—the test of *the significance of differences*—which, if the rules are followed, will measure the probability of so large a difference happening by chance. If it could have happened only very rarely by chance, that is, if it was not "just an accident," we would recommend the use of humus to increase, by about 3 inches, the height of seedlings at transplanting time. The same statistical procedure will, incidentally, furnish an estimate of the variability of results to be expected in the use of this treatment under the same conditions. The decision whether the 3-inch increase, with its liability to variation, is worth while and of *practical* importance is beyond the field of statistical methods.

Note that we made the prediction about the effect of adding humus on the assumption it would be used "under the same conditions." Conditions are, of course, never really the same. In fact, if we compared a single treated bed with a single untreated one, a part of the difference in height might have been due to differences in the original texture or fertility of the soil. If we had selected at random from all the beds in the nursery a number—say 6—to which to add humus and the same number to leave without humus, we could then have de-

termined how much seedling height at transplanting time varied in beds treated alike, and by a statistical procedure called *the analysis of variance*, could have arrived at a more precise measure of the effect of the humus treatment and of the variation associated with it. As a consequence, we could have predicted more reliably what to expect following use of the treatment. Go a step further. Suppose half the humus-treated beds and half the untreated beds had been watered. The analysis of variance would then enable us to evaluate the effect of watering and the effect of humus treatment separately, with the variation associated with each. We could also evaluate their combined effect; and their interaction, that is, determine whether response to watering is the same in humus-treated beds as in beds not humus-treated. More complex experiments to test the separate and combined effects of larger numbers of treatments and their interactions are readily handled by the method of analysis of variance.

Problems involving the relation of changes in one thing to changes in another are common in silvicultural research. How does the volume of even-aged Douglas-fir change as the stand grows older? If we measure the diameters, heights, and volumes of a number of loblolly pines, how can we analyze the data so as to estimate the volumes of other loblolly pines from measurements of their diameters and heights? The statistical procedure *correlation* is most useful in these and similar cases. The method of correlation has the advantage of being objective; it does not require the personal judgment that must be used to draw free-hand curves. It can handle any number of variables; in graphic work two independent variables are about the limit. The procedure is standardized so that all workers using the same data would come out with the same result. It provides a measure of how much of the original variation in the dependent variable is accounted for by its correlation with the independent variables, and evaluates the error of estimate to be expected in making predictions.

Hardly a study can be made in silvicultural research without using *sampling*. In each of the examples described so far it was necessary. Not all the trees in the uniform planting could be measured, and certainly not all the seedlings in the nursery beds. Wherever measurement of a part of the individuals in a population must be made to serve instead of measurement of all the individuals, sampling is involved. This branch of statistical methods tells how to take unbiased samples, representative of the population; how to estimate the number of plots needed in an experiment; how to sample efficiently by using devices that increase the precision of sample averages without the need to increase the number of measurements; how to apply the results of sampling accurately, and to best advantage.

Finally, *the design of experiments* integrates the physical layout of the plots, trees, or other things being studied with the schemes that are to be used in analyzing the data. Experimental design dictates how the plots and trees are to be selected for treatment to avoid bias in the experimental results. Basic to all good experimental design are randomization and replication. That is to say, precautions must always be taken so that the personal judgment of the experimenter shall not determine which plots or trees are to be treated one way and which another, and always each of the treatments must be applied not to one plot or to one tree, but to a sufficient number so that the variability of the results can be measured.

In the humus-treatment experiment, outlined above, we used a simple experimental design involving 12 randomly selected plots in a nursery. Proper procedure would require that each of the 12 plots should have equal chance of being treated with humus or of being left without it. That is what we mean by saying that the treatment should be applied at random to half of the plots. Similarly, when we refine the experiment further by watering half of the beds, those to be watered must be selected entirely by chance—this can be accomplished by drawing numbers out of a hat, or in any other fashion that makes it impossible for the experimenter to decide ahead of time which plots are to be treated.

In this experiment four treatments were used: some plots received both humus and water; some received neither; on some humus was applied and water withheld; and on some humus was withheld and water applied. Note that each treatment was used three times. Thus the experiment was balanced and provision made to measure the variability of the results. Complex designs for more complicated situations are available in the textbooks.

Conclusion.—The objective of all experimental design, as well as of statistical methods in general, is to get the greatest amount of accurate information for the outlay of manpower, time, and money. Without a working knowledge of statistical methods no worker in silvicultural research can expect to reach that goal. The techniques of statistical methods applied to biological research are contained in an ever-increasing number of good books. We can recommend: George W. Snedecor's *Statistical Methods Applied to Experiments in Agriculture and Biology*, published by Collegiate Press, Inc., Ames, Iowa, which has gone through several editions, the 4th of 1946 being the latest; R. A. Fisher's *Statistical Methods for Research Workers*, Oliver and Boyd, London, the 10th edition of which was published in 1946; also his *The Design of Experiments*, same publishers, 5th edition, 1949; and F. X. Schumacher's and R. A. Chapman's *Sampling Methods in Forestry and Range Management*, Duke University, School of Forestry Bulletin 7, revised in 1948.

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Notes

Purpose of State Parks

Cornelius Hedges, on the night of September 19, 1870, sat around the campfire with members of an exploring expedition, in what is now the Yellowstone National Park. He suggested that, rather than capitalize on their discoveries of an area which was rich in natural beauty and wildlife of every form native to the region, they seek to have it set aside for all time as a reserve for the use and enjoyment of all the people. This was the idea behind the greater part of our national and state park development.

Probably the most widely accepted definition of conservation today is *wise* use. Cornelius Hedges thought that the wisest use that could be made of Yellowstone was to set it aside for all time as a reserve where the lumberman could not cut, where the hunter could not shoot, and where the wonders of nature could not be commercialized upon. This was wise use, this was conservation.

When our own state park system was formed, our leaders in this movement had the same idea, that is that we set aside a small portion of the 24,000 square miles in West Virginia as a reserve for the use and enjoyment of all of our people for all time. Consequently, up to this time, about 65 of these 24,000 square miles in West Virginia have been set aside for state purposes. I think this is wise use of the land. I think this is conservation.

Some of these areas were selected for park purposes because of their unusual scenic beauty. Others were selected for their connections with history, and still others were selected because they were so representative of our state's rugged mountains with their tumbling streams and green forests.

In setting aside an area for a state park, we naturally think that it is reserved for a special use. By special use, we mean wise use different from that for which most adjacent land is used. What would be a better use for our scenic and historical lands than to keep them as show spots of our state? What would be a better use for our state representative areas than just to look at them and show them to our friends after we have protected them from fire, from the axe and from the gun—show them with all of their natural growth of forest plants and animals.

There are those who would try to justify the exploitation of our fine state parks by advancing fallacious ideas, such as a little strip mining would not hurt, that just because a tree is old it should be cut for lumber, not stopping to think that an old tree with a hole in it is a source of beauty and a home for the park game animals and birds. It has passed "its peak," that is true, from a lumber harvest standpoint, but it is just at the period of highest production from the standpoint of harvesting enjoyment from it. Then even after it has fallen and aged to the point of a green, moss-covered log, it is still producing enjoyment for the nature lover. It is producing a cover for the ground squirrel, the skunk, and other animals that use fallen trees for a home. It is serving as a place for the leaves to collect, which act as a sponge for the rainfall and later decay to add to the humus of forest soils.

There are, too, those who visit our parks and see the wild game in its native haunts, becoming tame enough to be seen even by children after a decade or more of park protection. Lacking in appreciation and not realizing that much land adjacent to these areas is supplied with game from them, they suggest that maybe this game should be shot. Whether this idea is dressed up in terms like "game harvest" or "use of the sportsman," it still means "shot," and that means all those animals you see when visiting parks would be shot, first because they are tame. Why not over the hill maybe on the backside of the park where the animals are not seen so often? Yes, over the hill and beyond the park border, because when areas are hunted *they are no longer parks.*

The squirrel high in a hickory tree along the trail, the deer playing in the opening at sunset, the turkey flocks seen in the cove on an early morning hike, all are a part of your park the same as the song birds in the big trees and the big owl on the far away hill in the evening. When the birds, animals, and trees are taken away, there is no park.

When these animals, these birds, these trees, and these areas were reserved for park use, it was wise use, it was conservation.

In park areas it is necessary to make certain physical improvements so that our people may enter these areas and enjoy them while there. When one wants to visit our parks, accessible roads, a parking area, comfort stations, picnicking space, drinking water, etc., are a necessity. In several of our parks, cabins in this woodland setting are provided for those who would enjoy a few days in these surroundings. Guard rails and observation platforms are built for the safe observation of canyons and falls. But, all these man-made improvements are worked in as near as possible to tie to the things that are naturally there because one visits these areas, not to see what "improvements" man has made, but to see an area that has not been "improved" by man.

As the years go by, our parks will stand out more in comparison with the surrounding territory because they are not harvested and the true conservationist will be more proud of them because they have been used wisely; they have been set aside for all time as a reserve for the use and enjoyment of all the people.

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Higher Animals and Forest Soil Fertility

The role of higher animals in soil fertility has been mentioned in the literature (*2, 4*) but the emphasis has been mainly upon the effect of burrowing animals and grassland and desert small mammals. The role of the larger mammals has received little recognition.

The populations of higher animals ranging over the upland forest soils in the Lake States undoubtedly influence the chemical composition of the soil. The increase in the availability of plant nutrients from the excrement of species such as the whitetailed deer, fox, red and grey squirrels, and cotton tail rabbits as well as the upland bird species certainly warrants theoretical consideration.

However, it is felt that the effect of higher animals on soil fertility is especially noteworthy in the lowland soil types, more specifically in areas that are subject to heavy winter yarding of the white-tailed deer (*Odocoileus virginianus borealis* Miller) and high concentrations of the varying hare (*Lepus americanus* Erxleben).

Samples of deer droppings taken in a cedar-spruce swamp indicated a composition of 1.38 percent nitrogen, 0.80 percent phosphoric acid (P_2O_5), and 0.26 percent potash (K_2O). This composition compares very favorably with the composition of the excrement of farm animals (*3*), probably most closely resembling the solid excrement of hens.

The average daily weight of droppings from each of four female adult deer and one male fawn fed on cedar browse during a 10-day period was 1083.6 grams (2.38 pounds)[1]. During an average yarding season of 90 days (*1*), about 4081 pounds of manure per acre per year would be applied through natural means in a deer yard supporting a concentration of two deer per acre. In addition, there is the fertilizing value of the *liquid* excrements. Taylor (*4*) emphasizes that animal manuring not only consists of an addition of metabolized plant materials but also concentrates plant nutrients and provides for more effective incorporation in soils.

The composition of feces analyzed in a feeding experiment with cedar browse as the total diet shows considerable variation between animals (Table 1). No analysis has been made on rabbit pellets or the droppings of other animals whose habitat is the lowland forest and soil types.

The larger mammals in the upland forest soil types aid in hastening the natural cycle of the elements involved in plant growth. In lowland swamp types, especially those in which there is heavy deer yarding and high concentrations of the varying hare, occur the effect of higher animals on soil fertility assumes an added importance.

TABLE 1.—ANALYSES OF FECES FROM DEER FED ON CEDAR BROWSE DURING A TEN DAY PERIOD

Animal			Percent of				
Sex	Age	H$_2$O	Protein[1]	Ash[1]	Calcium[1]	Phosphorus[1]
F	Fawn	64.10	9.21	13.33	1.49	.365
F	Adult	57.97	5.97	6.03	1.86	.249
F	Adult	58.11	10.86	5.71	1.77	.255
F	Adult	61.20	9.18	10.51	2.72	.271
M	Fawn	66.92	10.45	8.76	2.49	.253
	Mean	61.66	9.93	8.87	2.07	.279

[1]Dry weight basis.

Literature Cited

1. DAVENPORT, L. A., W. SHAPTON, and W. C. GOWER. 1944. A study of the carrying capacity of deer yards as determined by browse plots. Ninth North Amer. Wildlife Conf. Trans. Pp. 144-149.
2. HAMILTON, W. J., JR. and D. B. COOK. 1940. Small mammals and the forest. Jour. Forestry 38:468-473.
3. SALTER, R. M. and C. J. SCHOLLENBERGER. 1938. Farm manure. Soils and Men, U. S. Dept. Agric. Year book. Pp. 445-461.
4. TAYLOR, W. P. 1935. Some animal relations to soils. Ecology 16:127-136.

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[1]Much of the actual data used in this note has been drawn from unpublished reports by L. A. Davenport, formerly in charge of deer feeding experiments at the Cusino Wildlife Experiment Station, Shingleton, Michigan.

Development of Nineteen-Year-Old Southern Pine Plantations in Tennessee

In October 1947, the Southern Forest Experiment Station examined some 19-year-old experimental plantings at the old Madison Nursery near Jackson, Tenn., to determine their value for timber production and erosion control. The plantings included exotic and native species. It is especially interesting that two of the successful species, slash and longleaf pine, are considerably north of their native range. The trees were planted by the Forestry Division of the Tennessee Department of Conservation, which cooperated in making the recent examination.

It was evident after a preliminary survey that ponderosa pine, red pine, sugar pine, eastern white pine, Norway spruce, Japanese larch, and white ash, because of their very poor survival or subsequent development, are not suitable for reforestation or erosion control in the area. Detailed examination was therefore confined to the four principal southern pines: shortleaf (*Pinus echinata* Mill.), loblolly (*P. taeda* L.), longleaf (*P. palustris* Mill.), and slash (*P. caribaea* More.).

There are four plantations, one for each species, each approximately one-half acre in area, and adjacent to one another. They were established in the spring of 1929, using the same planting method and 6- by 6-foot spacing. The loblolly seedlings were 1-0 locally grown stock. The seedlings of the other three species were 1-0 stock from a North Carolina nursery. Planting records do not mention the grade of the stock. The plots are on abandoned cropland, Loring silt loam soil, from which 50 to 100 percent of the topsoil had eroded. Slight gullying had taken place; the gullies were most numerous in the longleaf plantation.

Table 1 summarizes the information obtained for each plantation in October 1947. Because only one plantation of each species was studied, differences may not be due to species alone and the following results can only be considered

TABLE 1.—STAND AND STOCK DATA FOR 19-YEAR-OLD PINE PLANTATIONS NEAR JACKSON, TENNESSEE

Item	Loblolly	Shortleaf	Slash	Longleaf
		All trees		
Survival (percent)	80	89	47	40
Trees per acre (number)	964	1,064	569	481
Basal area per acre (square feet)	138.7	115.9	88.7	107.8
Average d.b.h. (inches)	5.2	4.4	5.3	6.4
		Trees 4.6 inches d.b.h. and larger		
Trees per acre (number)	504	410	286	335
Basal area per acre (square feet)	116.1	78.0	76.4	97.4
Average d.b.h. (inches)	6.5	5.7	7.0	7.3
Average height to 3-inch top i.b. (feet)	19	15	20	22
Average total height of dominants and codominants (feet)	40	29	39	41
Average proportion of total height in live crown, dominants, and codominants (percent)	52	48	56	58
Volume to 3-inch top, per acre:				
Gross cubic feet, i.b.	1,328	701	803	1,137
Rough cords	17.6	9.3	10.6	15.0
Fence posts per acre (number) [1]	1,296	880	778	1,019

[1] Round posts 7 feet long with a minimum top diameter of 3 inches, inside bark, obtainable in lieu of cordwood.

indicative.

Loblolly and shortleaf survivals were 80 and 89 percent. For reasons not explained by the records, longleaf and slash survivals were low (40 and 47 percent).

Shortleaf pine had been severely damaged by the pine tip moth (*Rhyacionia frustrana* Comst.), and most terminals were still infested. Loblolly showed signs of tip moth only in a few laterals. Slash and longleaf showed no evidence of tip moth. Loblolly, slash, and longleaf were in general very thrifty. Southern fusiform rust (*Cronartium fusiforme* (Arth. & Kern) (Hedge. & Hunt) was not noted at all. Sleet had broken a few longleaf tops but had not affected the other pines.

The shortleaf and loblolly stands had almost completely closed crown canopies with only a few very small openings. Many large openings existed in the slash pine plot, for the surviving trees were unevenly distributed. Longleaf, with a lower survival than slash, had better crown closure and smaller openings because the surviving trees were more evenly distributed.

It is not known how much active erosion was taking place at the time the seedlings were planted. All plots now have a complete ground cover of needle and leaf litter, native grasses, shrubs, vines, and hardwood reproduction. Further loss of soil is being effectively prevented.

Seedlings of the species planted were present in three of the plots: longleaf was bearing cones but no seedlings could be found. Sweetgum, red maple, dogwood, blackgum, persimmon, southern red oak, and eastern red cedar were invading all plantations but were least numerous in the loblolly stand.

Loblolly had produced the highest basal area—138.7 square feet per acre. Shortleaf was next with 115.9 square feet. Longleaf, with a survival of less than one-half that of loblolly or shortleaf, produced 107.8 square feet. Slash pine produced only 88.7 square feet. Trees 4.6 inches d.b.h. and larger comprised 84 to 90 percent of the total basal area in all species except longleaf, where only 67 percent of the trees were 4.6 inches d.b.h. and larger.

Considering only trees 4.6 inches d.b.h. and larger, longleaf had the largest average diameter at breast height, 7.3 inches, and the greatest average merchantable length, 22 feet. Dominant and codominant trees also averaged tallest in this species, 41 feet, and at the same time their crown-length ratio averaged highest, 68 percent. This indicates that lumber from these trees may be low in quality. Shortleaf had the smallest average d.b.h., 5.7 inches, the least total height, 29 feet, and the shortest merchantable length, 15 feet.

Loblolly has produced the highest volume per acre in trees 4.6 inches d.b.h. and larger, 1,328 cubic feet, inside bark. This equals 17.6 cords of rough wood. Longleaf came next with 15.0 cords. Shortleaf, with the highest survival, produced only 9.3 cords. Slash pine produced 10.6 cords. Despite the greater cord volume in slash pine, the shortleaf plantation contained more fence posts, mainly because there were about twice as many trees.

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A Relation Between Topography and Douglas-Fir Site Quality

The belief is quite commonly held that hilltops, ridges, and upper slopes do not usually produce as rapid tree growth as do sites on lower slopes and depressions, but little experimental evidence can be found to support the opinion.[1] Some such evidence, however, has been gathered in connection with a soil survey of the Voight Creek Experimental Forest,[2] where the relation between

[1] Since submission of this paper, a more detailed study has been published which further indicates the importance of slope position as it affects soil quality and plant growth. See Aandahl, Andrew R., Soil Science Society of America Proc. 13:449-454. 1948.

[2] The Voight Creek Experimental Forest, located near Orting, Wash., is a cooperative study tract owned by the St. Paul and Tacoma Lumber Company and experimentally managed by the Puget Sound Branch, Pacific Northwest Forest and Range Experiment Station.

type of topography and site class of Douglas-fir was found to be statistically significant.

Two soil types, Barneston gravelly sandy loam and Indianola fine sandy loam, occupy most of the experimental forest. Both of these soils are dervied from Pleistocene material, which was deposited by glaciers originating in the canyons of the Cascade Mountains to the east. Descriptions of typical profiles of these two soils follow:

Barneston Gravelly Sandy Loam

0 to 1½	inches	coarse mull humus layer
1½ to 14	inches	brown or yellowish brown gravelly sandy loam
14 to 30	inches	yellowish brown to yellowish gray gravelly sandy loam or loam with localized areas of iron staining and some vesicular development
46 inches	plus	gray, loose, and porous, poorly assorted sand, gravel, and stone

Indianola Fine Sandy Loam

0 to 1½	inches	coarse mull humus layer
1½ to 8	inches	brown fine sandy loam, slightly darker at the surface with scattered shot pellets
8 to 18	inches	medium or yellowish brown fine sandy loam with some shot pellets
18 to 30	inches	yellowish brown or yellowish gray loamy fine sand without coalescence
30 inches	plus	gray stratified pepper and salt sand, loose and porous

For this study topography was classified by the terms *convex* and *concave*. Convex topography includes situations of relief such as ridges, hilltops, and upper slopes. The predominating effect of convex topography on the site is to impoverish the soil of fine material and humus through erosion and to remove soluble salts and moisture through drainage. Concave topography includes situations of relief such as lower slopes, valleys, and basins. The predominating effect of concave topography on the site is to build soil by deposition of fine soil material, soluble salts, and moisture from higher-lying lands.

One of the basic reasons for the soil survey was to measure the productivity of different soil types. Measurements of site quality were available from a series of 25 permanent sample plots uniformly spaced over the forest. From these measurements, the average Douglas-fir site index was found to be 139 for the Barneston soil and 147 for the Indianola. An analysis of variance showed no real differences between these two average values, but a difference significant below the 5 percent level was found between the site indexes for concave and convex topography—both when each soil was considered separately and when the data for both soils were combined.

The explanation for these differences in site quality is confounded among variations in soil depth, moisture, nutrient supply, aeration, temperature, etc. according to topography. No specific reason for the differences is isolated by findings from this soil survey; yet the fact is still apparent that in the soil types studied concave topography is associated with significantly higher site quality for Douglas-fir than convex topography. This is an example of one of the difficulties encountered in attempting to relate timber productivity to a soil classification unit. Such a relation is the goal of much of the present forest soils research.

One means of strengthening the soil classification unit in this study area would be to map a *phase* of the soil type based on topography. This additional separation would not appreciably complicate the mapping job and would tie the soil classification unit more closely to the true site quality.

Soil Type	*Topography*	*Average Site Index*
Barneston gravelly sandy loam	Concave	151
	Convex	128
	Average of all plots	139
Indianola fine sandy loam	Concave	159
	Convex	141
	Average of all plots	147

Although this observation of topographic differences as they affect site quality certainly cannot be extended into all other soil types without study of individual cases, it suggests that some soil surveys may require a measure of topographic conditions besides the fairly broad soil mapping units now commonly used. Inclusion of such a measure would do much to indicate certain important soil differences, the definition of which usually requires an impractical amount of time under the relatively low intensity of most forest soil survey work.

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Wood Chips for "Overgrazed" Recreational Areas

A. J. Appel's note in the May JOURNAL OF FORESTRY, page 368, advocating the use of sawdust as a possible soil restoration method on "overgrazed" recreational areas was thought provoking.

The hazardous condition of these over-populated, public areas is well known. On too few areas are adequate correctional measures being employed. Soil conservationists could be of real assistance to park supervisors by assisting in developing area plans for the control of surface waters which are responsible for carrying away the litter and soil as it is broken and scuffed up by tramping feet.

Sawdust can be used but it will float easily and will drift away when heavy rains create surface waters. When dry it shifts with the wind. Coarse chips can be used in the same manner and are much more stable.

On the use of wood chips the following is quoted from Department of the Air Force publication AFM 90-1, *Grounds Construction and Maintenance*, February 1949, page 48:

The ground surface is bladed to level, watered to moisten the surface, and 235 cubic feet of chips are spread evenly over each 1,000 square yards of surface. The

chips are produced with a "hogging" machine used in converting waste wood into fuel in western forests, and the individual chips are one-half to 1 inch long and one-fourth to one-half inch wide, and one-eighth to one-fourth inch thick. After spreading, the area is dragged or smoothed with suitable implements, and rolled to firm the chips into the soil. This treatment has provided a resilient dust-controlled surface for a year under intensive foot traffic, and required only an occasional resmoothing and rolling. The suitability of the treatment is dependent on availability of chips and the grade of the field surface. Chips wash down slopes badly in heavy rains. Areas treated with chips are easily converted to grass cover at a later date.

Portable wood chippers are now available. They can be used to utilize pole and branch wood accumulating from clean-up and improvement cutting. They can produce very coarse or fine chips. Their flexibility for use readily adapts them to many farming, forestry, or recreational uses. It is conceivable that portable wood chippers will become standard equipment for many park and forest recreational agencies.

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Growth of the Soil

On two-thirds of the land area of the Pacific Northwest the natural growth of the soil is trees. Only a few valleys are fit for farming. The soil is not only good for tree growing but the climate, the native timber species and the general topography combine to give us the nation's greatest natural forest region.

Our prospect is good for large units of scientifically managed forests in the future—"sustained yield units" in forestry jargon—once the legal and economic questions of uniting the many kinds of ownerships have been solved. These units may be national or state forests, or privately owned tree farms, or groups of small forests organized in cooperatives like the one that is already a going concern in Snohomish County, Wash.

The soil is the thing. Forestry has little to do in the stands of virgin timber, apart from surveys and protection from fire and tree diseases. The big job of forestry is in keeping the soil productive under the log harvest, getting new tree growth started and controlling fire. On public lands or private lands, the forester and the logger must team up, if the basic forest resource—the soil—is to be kept productive.

Forestry begins at the stump, even as lumbering begins there.

It is in the growth of the soil that the term, "tree farming," has its real roots, its vital meaning. The logger compares to the wheat rancher in that both harvest the growth of the soil. Each harvest must leave the soil in productive condition, or eventually the wheat ranch will become desert land and the forest land will become barren.

The scientist whose business it is to find ways and means to keep agricultural soil productive and to improve its crops is called an agronomist. The foresters's business is the same, except that its place is on forest land. On the wheat ranch the agronomists's work starts with the stubble after harvest. The forester's work starts at the stump.

Remember that the stumps of the forest are not only those of logging. In nature, trees decay and die, and the stumps of nature are many in the virgin forest. In some areas of the Douglas-fir region half of the timber is more stumps than trees. Forest fires leave only stumps of trees in their black wake — worse, in the eyes of the forester, they leave soil robbed of much or all of its fertility, its ability to grow trees. So even in the national parks, forestry is centered on the stumps of the forest and the growing of trees to replace them.

Our forests need nothing so much as college loggers, educated tree farmers, young men with rugged bodies and trained minds.

Forestry is anything but a money career, but to my mind this is really a strong point in its favor. What counts is that no profession has more promise of health, happiness, good human association, and of constructive work for mankind in it than the profession of forestry contains. There is none in this region with a stronger challenge to the spirit of battle in a young man. And what more could one want?

To give a new twist to an old saw, go to the woods, young man, and grow up with the forest. Yes, and go as a college logger.

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Reviews

The Foundations of Prosperity.

Published by CIO Committee on Regional Development and Conservation. 32 pp. Washington, D. C. June 1950. 25 cents.

With the coming to maturity of organized labor in the United States an increasing interest in broad public matters is making itself manifest. In recent years the major union representatives of American working men and women have shown greater concern over resource management through resolutions at conventions and participation in conferences with other groups. The CIO has made the first formal statement of policy covering the whole natural resource field.

The first part of the booklet setting forth the reasons for and the history of the CIO's interest in resource conservation and regional development represents about as statesmanlike position as any to be found on as comprehensive a subject. Admitting concern as an initial impetus, the greater relationship between adequate resources and a continuance of our way of life is emphasized. Many who are accustomed to thinking of resource policies in specialized terms of either forestry, soil, water power, or whatnot will find the grasp of CIO committee exceedingly broad. Others who tend toward status quo situations will be pleasantly surprised at the well-balanced thinking presented in spite of the definite leaning toward public interest viewpoints.

Each major resource is treated separately and specific policy and remedial recommendations are set forth under each heading. Unfortunately, space limitations prevented full discussion of the assumptions underlying the recommendations. Yet their realism is indicative of an underlying understanding of the problems at issue. The committee apparently spent little time quibbling over the statistics of the forest situation. Overcutting of timber resources beyond growth seemed clearly indicative of the need for restraint in the form of public regulations. In addition the committee endorses extension of the national forest system and purchase of "in-holdings," forest credits, and other aids to private owners, expansion of the forest access road system, and opposition to sustained yield units where granting of monopoly privileges pertained. It is surprising to find the old forest leasing idea revived for experimental development in connection with the management of non-resident holdings.

Nearly all the recommendations have been discussed pro and con thoroughly in the JOURNAL and foresters are generally cognizant of them. The tendency toward public forestry activities will surprise no one since labor is not in the holding group and must rely on governmental programs to achieve its objectives.

In discussing water development programs the CIO committee finds itself in accord with a large segment of public opinion. Although a firm stand is taken against the unplanned "pork-barrel" water projects of the Army Engineers and the Bureau of Reclamation, it will not surprise many readers to find that the principle of public ownership of hydro-electric power is endorsed. It follows that the Valley Authority idea is given endorsement as a logical means for achieving coordinated river basin planning. Unfortunately, no suggestions for extending local participation nor mention of the Muskingum approach to watershed management were included.

Considerable attention is given to soil conservation (the need for PMA—SCS coordination), range management, recreational resources, and game and fish. Most conventional conservationists will find general agreement with the proposed policies in these fields. Labor's interest in adequate opportunities for outdoor recreation is well stated and hard hitting support is given for the maintenance of wilderness areas free from the encroachments of "developers."

A wide variety of associated topics are covered in the pamphlet including a call for greater coordination of governmental flood control, reclamation and navigation programs, public purchase of private utilities, conservation programs for the non-renewable mineral resources, and other less closely allied subjects. The pamphlet closes with an appendix including various convention resolutions and statements of policy by the CIO adopted prior to the work of the committee.

Several of the proposed programs can be criticized—some from the technical viewpoint, others because many will disagree with the emphasis on federal programs. Nevertheless, this CIO booklet is recommended reading to every forester concerned with public policy matters. During this period in American history with our heavy emphasis toward immediate private enterprise considerations, it is essential that we have for comparison the public enterprise viewpoint clarified by a responsible and powerful group.

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Western Land and Water Use.

By Mont H. Saunderson. 217 pp. Univ. of Oklahoma Press. $3.75.

Mr. Saunderson, an agricultural economist, long on the staff of the U. S. Forest Service, is well equipped to write a definitive book about the land resources of the West and how they are being used and abused. In this volume he has accumulated most of the pertinent data, and has subjected them generally to a rational analysis.

Unfortunately, although the volume is divided into chapters, the components of the chapters are

scrambled. There is no logical order, so that the net effect is that of flitting from one topic to another. This makes the analysis rather difficult to follow, and his main theses become obscure.

The author is a careful scholar and not prone to wild deductions, but he offers no documentary proof for his statements. The reader continually asks: where did he get the facts to support this or that conclusion?

There are sections of fine writing—picturesque descriptions of the great scenic lands west of the hundredth meridian—but the bulk of the volume is written in a dry, blank-face style that robs the conclusions of much of their punch.

Although "water" is one-half of the title, this subject receives relatively little attention. Being an agricultural economist, the author is overwhelmingly interested in land and usually discusses water as an incidental part of land use. In view of the great water problems of the west, the reverse order might seem more logical—if not more intriguing.

Despite these drawbacks the book is loaded with interested facts and observations. The grazing situation in the West is fully covered, both historically and currently, and the conclusion is familiar to U. S. Forest men—that ranching has trended toward large-scale speculative holdings and investments, and this is resulting in a "mining" type of operation. In brief, inflation of ranch values "is inimical to good land use."

On reclamation the author is equally sound. He says, "Irrigation which can be accomplished by direct stream diversion and small supplemental storages has now been fully done, perhaps overdone." What remains to be done to expand the irrigation agriculture in the West is now up to the federal government.

On forestry the author adopts the point of view that perhaps it is too late to prevent the timber famine—at least in sawlogs—resulting from the "mining" of the western forests. The realities of the price structure prevent the bulk of landowners from operating on a sustained-yield basis. Shying away from any discussion of governmental regulation of forest land use, or expansion of government ownership, the author suggests a program of "production goals" such as was used effectively in World War II by the Department of Agriculture to attain the needed production of essential food and fiber crops. "This program would necessarily include a provision for forward pricing of timber. It would mean incentive payments to individuals to attain certain management objectives."

One can take issue with this point of view as judged by the record of the Agricultural Conservation Program of the Department of Agriculture. Despite the expenditure of 250 million dollars annually on this program, soil conservation is not greatly advanced in the opinion of many students of the problem. Would a similar program for forest land bring any better results? Some of us doubt it.

Among the more interesting facts assembled in this volume are the relative values of the resources of the western national forests. The chart on page 102 offers a spectacular insight. It assesses the annual revenue values of these forests as follows:

	Dollars
Water	278 million
Recreation	20 million
Grazing	3 million
Timber	18 million

If this scale of values is even approximately correct, the management policy of the U. S. Forest Service requires extensive reorientation. At present, the forests are managed primarily with a view to safeguarding and maximizing the timber and grazing resources. There is little conscious watershed management. Yet the watershed value is more than ten times that of the grazing and timber combined. The implications, however, are increasingly coming to the fore, and more and more we hear in the Forest Service discussions of the necessity of safeguarding the precious water resource. Up to now the Service has been rather slow to back up this conviction with action. Such action as is needed cannot be taken without harming many vested interests, as for example requiring loggers to take out the timber without upsetting the stability of the soil and the water regimen, or enforcing immediate reductions of cattle and sheep on highly eroded and erosive localities. What the Forest Service needs, as the Izaak Walton League declared at its last annual meeting, is a more aggressive policy in safeguarding the soil and water resources from predatory private interests. Mr. Saunderson, however, does not touch on these implications of his facts.

ANTHONY NETBOY,
Washington, D. C.

Pennsylvania's Susquehanna.

By Elsie Singmaster. 236 pp. Illus. J. Horace McFarland Co., Harrisburg, Pa. 1950. $6.

Draining nearly one-half the area of Pennsylvania, the Susquehanna River has been important to the development of the Commonwealth, historically, economically, and socially. Although commercially not as significant as the Mississippi, the Hudson, and others that might be mentioned, the Susquehanna is unquestionably one of the most beautiful rivers of America. And more than two hundred years of encroachment, of industrialization, and of pollution have not destroyed its loveliness.

This book is not easily described or labeled. It is a fascinating potpourri of history, folklore, aesthetics, and several other ingredients including a little botany and geology. For one who has never seen the Susquehanna, this volume will provide delightful reading. For one who, like the present reviewer was born and raised on its banks, the book evokes feeling of most pleasant notalgia.

Miss Singmaster (Mrs. Lewars of Gettysburg) is one of Pennsylvania's best beloved writers. She knows the Susquehanna intimately. The collaboration of R. B. McFarland, whose hundreds of photographs combine attractively with

the text, is a most fortunate one. All in all, the book is as beautiful as it is interesting.

HENRY CLEPPER.

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Einfuehrung in Die Forstliche Zuwachs-und Ertragslehre. (Introduction to the Knowledge of Forest Increment and Yield).

By Karl Vanselow. 3d ed., 156 pp. Illus. I. D. Sauerlaender, Franfurt a. M. 1948.

This publication is a reissue, with only three minor changes, of the first edition, which appeared in 1941. Vanselow's book fills the need for a more comprehensive treatment of growth and yield of forest stands, than this important and complex subject generally receives in textbooks on mensuration or forest management. The clear presentation of the factors determining the growth and yield of forests is richly illustrated from the vast store of data contained in yield tables, forestry periodicals, and experiment station publications, applicable to the forests of Central Europe.

After explaining the various components of the growth of single trees, the author discusses in detail the growth and yield of pure and mixed even-aged high forests of the principal European species; spruce, pine, fir, beech, and oak. The effect of thinnings on the development of the stand receives thorough attention, since the author has devoted many studies to this subject during his long career. American foresters will be interested in the following statments, which the author bases on comparative experiments that have been conducted for many years. The various thinning methods, as ordinarily practiced in Germany, have about the same effect on total production of wood, and do not increase the growth of wood except in stagnating stands, while heavy thinnings cause a reduction of growth. The merit of thinnings lies in the fact that a greater quantity of products of high quality, and in a shorter time, may be produced in thinned compared with unthinned stands.

Growth and yield of uneven-aged forests managed by the selection system, of coppice, and of coppice with standards are briefly discussed.

The final chapter dealing with the yield according to assortments is illustrated with tables and graphs taken from Mitcherlich and others.

R. STAHELIN,
U. S. Forest Service, Washington, D. C.

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Correction

This issue (October 1950) of the JOURNAL OF FORESTRY corrects the page numbering which for the past two months (August and September) has been 200 pages out of correct order. For those who bind their JOURNAL volumes and for librarians, authors, and others who refer to Literature Cited, the index of the JOURNAL will include for the months in error the issue as well as the volume and page number. The editor regrets the confusion which may be caused by this inadvertant error and requests authors and others to help avoid further confusion by using both volume and month of issue in future references to the June, July, August and September 1950 numbers in which the page-number duplication occurred.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, The New York State College of Forestry*

Range Management Section Compiled by FRANCES J. FLICK, *Library, U. S. Department of Agriculture*

General

Forever the Land. Ed. by Russell Lord and Kate Lord. 394 pp. Illus. Harper Bros., New York 6. 1950. $5.

Man on the Landscape. By V. G. Carter. 129 pp. Illus. National Wildlife Federation, Washington, D. C. 1949. $1.50.

The Story of California Big Trees. By H. E. Davenport. 44 pp. Illus. Calaveras Grove Assoc., Stockton, Calif. 1949. $1.

Forest Economics

Does Farm Timber Growing Pay in the South? By W. K. Williams and M. M. Bryan. 8 pp. U. S. Forest Serv., Washington, D. C. 1950. U. S. Dept. of Agric. Leaflet No. 277. 5 cents (Govt. Print. Off.).

Forest Influences

A Trapezoidal Flume for Gaging Mountain Streams. By B. C. Goodell. 18 pp. Illus. Rocky Mt. Forest and Range Expt. Sta., Fort Collins, Colo. 1950. Station Paper No. 2. Mimeog.

Forest Management

Management of Natural Slash Pine Stands in the Flatwoods of South Georgia and North Florida. By R. D. McCulley. 57 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1950. Cir. No. 845. 20 cents (Govt. Print. Off.).

Forest Products

Forest Products Research Guide, 4th ed. 340 pp. National Lumber Manufacturers Assoc., 1319 18th St., N. W., Washington 6, D. C. 1950. $5.

Markets for Forest Products in Florida. By A. S. Todd, Jr. 71 pp. Southeastern Forest Expt. Sta., Asheville, N. C. in coop. with Florida Forest Serv. Station Paper No. 7. 1950.

Forest Resources

Catalogue of Kenya Timbers. By S. H. Wimbush. 69 pp. Colony and Protectorate of Kenya, Nairobi. 1950. SH. 2/50 (Govt. Printer).

Forest Resources and Industries of Missouri. By D. B. King, E. V. Roberts and R. K. Winters. 89 pp. Illus. Univ. of Missouri Agric. Expt. Sta., Columbia. 1949. Res. Bul. No. 452. Contrib. of Central States Forest Expt. Sta.

Forest Statistics for Lake County, Oregon. By F. L. Moravets. 19 pp. Pacific Northwest Forest Expt. Sta., Portland, Ore. Forest Surv. Rept. No. 102. 1950. Mimeog.

Softwood Survey. 1. The Main Producing Areas and Their Species. By G. V. Donnelly. 9 pp. Illus. Timber Development Assoc., Ltd., London. Timber Information Ref. No. 40.

Logging and Milling

A Review of the Results Obtained in Training Choppers in Pulpwood Operations. By A. M. Stewart. 5 pp. Canadian Pulp and Paper Assoc., Montreal. 1950. Paper given at Woods Labour Session, Annual Meeting.

Using the Wet and Dry-Bulb Thermometers in Lumber Dry Kiln Work. 3 pp. Plates. U. S. Forest Products Lab., Madison, Wis. R1772. 1950. Mimeog.

Pathology

Log Defects in Southern Hardwoods. By C. R. Lockard, J. A. Putnam and R. D. Carpenter. 37 pp. Illus. U. S. Dept of Agric., Washington 25, D. C. 1950. Agric. Handbook No. 4. 25 cents (Govt. Print. Off.).

Protection

Damage to Guayule by Insects and Mites with Notes on Control. By T. P. Cassidy and others. 19 pp. Illus. U. S. Dept. of Agric., Div. of Forest Insect Inv., Washington 25, D. C. Cir. No. 842. 1950. 10 cents (Govt. Print. Off.).

Forest Fires and Forest Fire Control in Michigan. By J. A. Mitchell and D. Dobson. 82 pp. Illus. Michigan Dept. of Conserv. in coop. with U. S. Forest Serv. 1950.

Wet Water for Forest Fire Suppression. By W. L. Fons. 5 pp. Calif. Forest and Range Expt. Sta., Berkeley. Forest Res. Notes No. 71. 1950. Mimeog.

Range Management

Converting Standard Seeding Rates for Grasses to Actual Seeding Rates per Acre. By J. F. Pechanec. 4 pp. U. S. Forest Serv., Pacific Northwest Forest & Range Expt. Sta., Portland, Oreg. Research Note No. 67. July 10, 1950.

Nutritional Requirements of Ewes Wintered under Range Conditions. 1, Protein Requirements, Progress Rpt. By J. L. Van Horn and others. 16 pp. Mont. Agric. Expt. Sta., Bozeman. 1950. Mimeog.

Range—Condition Classes on the Laramie Plains, Wyoming. By A. A. Beetle. 7 pp. Wyo. Agric. Expt. Sta., Laramie. Cir. No. 37. April, 1950.

Research Work Conducted by the U. S. Range Livestock Experiment Station, Miles City, Montana, in Cooperation with the Montana Agricultural Experiment Station. 11 pp. Illus. U. S. Bur. of Animal Industry, Washington 25, D. C. 1950.

Silviculture

Growth and Yield of Upland Balsam Fir in the Lake States. By S. R. Gevorkiantz and L. P. Olsen. 24 pp. Lake States Forest Expt. Sta., St. Paul 1. Station Paper No. 22. 1950. Mimeog.

Size-Class Distribution in Old-Growth Northern Hardwoods Twenty Years After Cutting. By F. H. Eyre and W. M. Zillgitt. 15 pp. Lake States Forest Expt. Sta., St. Paul 1. Station Paper No. 21. 1950. Mimeog.

Some Observations on the Seedfall of Sugar Pine. By H. A. Fowells. 3 pp. Calif. Forest and Range Expt. Sta., Berkeley. 1950. Mimeog.

Wood Preservation

Making Wood Fire Retardant. By T. R. Traux. 8 pp. U. S. Forest Products Lab., Madison, Wis. D1760. 1950.

The Soaking Method for the Preservative Treatment of Fence Posts. By R. D. Graham. 24 pp. Illus. Oregon Forest Products Lab., Corvallis. Information Cir. No. 4. 1950.

Wood Technology and Utilization

Galactan in Western Larch Wood. By R. L. Mitchell and G. J. Ritter. 5 pp. U. S. Forest Products Lab., Madison, Wis. R1771. 1950. Mimeog.

Inventory of Unused Wood in District 5. 29 pp. Illus. Inst. of Forest Products., Univ. of Washington, Seattle 5. 1950. Bul. No. 4.

. . . . Same . . . *District 11.* 18 pp. Bul. No. 5.

Lamination of Connecticut Red Oak. By N. V. Poletika. 48 pp. Conn. Agric. Expt. Sta., New Haven. Bul. No. 537. 1950.

Properties of Some Bamboos Cultivated in the Western Hemisphere. By G. E. Heck. 13 pp. Plates and tables. U. S. Forest Products Lab., Madison, Wis. D1765. 1950. Mimeog.

Tannin Content and Other Characteristics of Native Sumac in Relation to Its Value as a Commercial Source of Tannin. By I. D. Clarke and others. 76 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. Tech. Bul. No. 986. 1949. 25 cents (Govt. Print. Off.).

Veneer Cutting and Drying Properties—Water Oak. 5 pp. U. S. Forest Products Lab., Madison. D1766-1. 1950.

. . . . Same . . . *Red Alder.* 2 pp. D1766-2.

Wood Products for Fertilizer. 53 pp. Illus. Northeastern Wood Util. Council, New Haven 6, Conn. Bul. No. 32. 1950.

Society Affairs

Compiled by ROBERT D. HOSTETTER, *Assistant Executive Secretary*

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1950

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Division of Watershed Management
(Officers to be elected.)

Golden Anniversary Meeting Features Diversified Program

Twentieth Century American Forestry Is Theme

Eminent Foresters Headline General Sessions
Division Speakers Present Varied Topics
Schlich and Pinchot Medals to be Awarded

"American Forestry In the Twentieth Century" from a midway vantage point furnishes the theme for recognized forestry leaders who will address 1,000 members and guests at the Society's Golden Anniversary Meeting on December 13 to 16, 1950. The Mayflower Hotel, Washington, D. C. is headquarters for the meeting.

President Charles F. Evans will extend the Society's greeting and welcome at the first general session at 9:30 a.m., December 14 in the Ballroom. Chairman of the session is M. W. Humphrey, past chairman of the Allegheny Section. He will introduce the four speakers of the morning who will treat parts of the subject, "The Society Takes Stock."

Samuel T. Dana, dean of the School of Natural Resources at the University of Michigan and a Fellow of the Society, will describe "The Growth of Forestry in the Past Half-Century." Another Fellow, Raphael Zon, will discuss "Forestry Mistakes and What They Have Taught Us."

"American Forestry in a World Perspective" will be viewed by J. D. B. Harrison, of the Forestry and Forest Products Division, Food and Agriculture Organization of the United Nations.

"Fifty Years of the Society" will be recounted by William L. Hall, a charter member and Fellow of the Society.

The final general session, scheduled to begin at 9:00 a.m. on Saturday, December 16, presents a view of the next half of the twentieth century in exploring the topic, "The Society Looks Ahead." Henry Schmitz, dean of the School of Forestry at the University of Minnesota and a Fellow of the Society, is the chairman for the final session.

First speaker will be George Banzhaf, consulting forester and recent chairman of the Wisconsin-Upper Michigin Section, who will discuss "The Relation of Forestry to Our Wood Supply." Describing "Test Tube Potentials" of wood and describing means of better wood utilization will be Carl A. Rishell, director of research for the National Lumber Manufacturers Association.

Tom Wallace, widely-known editor of the *Louisville Times* and an Honorary Member of the Society, will deliver an address on "Human Values of Forests."

"The Relation of Forests to Our Water Supply" is the topic to be discussed by A. R. Croft of Ogden, Utah and Marvin Hoover of Union, S. C. Both are foresters specializing in watershed management.

Lyle F. Watts, chief of the U. S. Forest Service and a Fellow of the Society will present the final paper of the meeting, "The Role of Forests and Foresters in Our National Economy." Time for discussion has been provided in both general sessions.

WILLIAM L. HALL
Fifty years . . .

Society Affairs Session

Thursday afternoon, December 14, will be devoted to reports of the president, executive secretary, and the Society's committees. The report of the newly appointed Committee on Policies and Objectives, Fred H. Brundage, chairman, is expected to be of particular interest. Discussion from the floor by members in attendance will be encouraged.

CHARLES F. EVANS
welcomes members.

Dinner-Dance

The annual Society banquet will be at 7:30 p.m., Friday, December 15 in the Ballroom at the Mayflower Hotel.

Presentation of plaques to the Society's living charter members—William L. Hall, Ralph S. Hosmer, and Henry S. Graves—will commemorate their half-century of service to the profession.

Also to be awarded are the Schlich medal and a new medal made available by Gifford Pinchot's family in honor of the Society's first president.

Tom Gill, world-renowned forester and author, will present an illustrated talk recalling some of the events and personalities shaping the destiny of

RAPHAEL ZON
and what they have taught us.

the Society and the forestry profession during its first 50 years in the United States.

An informal dance, with special intermission entertainment, will follow the banquet.

Division Meetings

Below are the tentative programs of the Society's ten Divisions. All Division meetings will be on Friday, December 15, with the exception of those of the Division of Education, which will be at 10:00 a.m. and 2:00 p.m. on December 13, and a preliminary session of the Division of Silviculture which will be at 8:00 p.m. on December 13.

Division of Education

Wednesday Morning, December 13
10:00 a.m.

1. Report of Committee on Graduate Training in Forestry. R. A. Cockrell, School of Forestry, University of California, Berkeley, Calif.

2. Report of Committee on Teaching of Forest Soils in Forest Schools. Earl L. Stone, Jr., Department of Agronomy, New York State College of Agriculture, Cornell University, Ithaca, N. Y.

3. "Trends in Forestry School Enrollment in the United States." Gordon D. Marckworth, School of Forestry, University of Washington, Seattle, Wash.

4. "Testing and Prediction of Success in Civil Service Examinations and in Subsequent Employment." Lewis M. Turner, Utah State Agricultural College, Logan, Utah.

LYLE F. WATTS
forests and foresters

Wednesday Afternoon, December 13
2:00 p.m.

Panel: "The Forestry Curriculum."

1. "Broadening the Forestry Curriculum." Hardy L. Shirley, New York State College of Forestry, Syracuse, N. Y.

2. "Forestry Training for Public Employment." H. D. Cochran, Division of Personnel, U. S. Forest Service, Washington, D. C.

3. "Training the Forestry Student for Work in Private Industry." Speaker to be announced.

Panel: "Apprenticeship Training in Forestry."

1. "Apprenticeship Training for Foresters in the Southern Pulpwood Industry." Earl Porter, International Paper Co., Mobile, Ala.

SAMUEL T. DANA
measures growth of forestry

2. "Apprenticeship Training for Foresters in Wood Utilization." Richard J. Preston, Jr., School of Forestry, North Carolina State College, Raleigh, N. C.

3. "Apprenticeship Training for Foresters in Western Industry." Speaker to be announced.

4. "Association Between the Universities and Industry in Canada." J. Miles Gibson, University of New Brunswick, Fredericton, N. B.

Division of Forest Economics

Friday Morning, December 15
9:00 a.m.

(Joint meeting with Division of Silviculture.)

1. "Forest Management — The Meeting Place of Economics and Silviculture." Leonard I. Barrett, Division of Forest Management Research, U. S. Forest Service, Washington, D. C.

CARL A. RISHELL
potentials

2. "The Role of Economics in Forest Management." William A. Duerr, Southern Forest and Range Experiment Station, New Orleans, La.

3. Panel: "The Application of Economics to Silvicultural Problems."

"In Managing Small Woodlands." E. B. Moore, Department of Conservation and Economic Development, Trenton, N. J.

"In Converting Unmanaged Loblolly Pine Stands to Sustained Yield." N. T. Barron, Camp Manufacturing Company, Franklin, Va.

"In Converting Mature Hardwood Stands to Sustained Yield." Walter M. Zillgitt, Lake States Forest Experiment Station, Marquette, Mich.

A short business meeting of the Division of Forest Economics will be held at 1:30 p.m. on December 15.

Division of Forest Products

Wednesday Afternoon, December 15
2:00 p.m.

Theme: "Progress in Forest Utilization and Its Effect on Forest Management Practices."

1. "The Relationship Between Forest Utilization and Forest Production." R. C. Hawley, School of Forestry, Yale University, New Haven, Conn.

2. "Forest Products Utilization, the Key to Good Forestry in the Pacific Northwest." Clyde S. Martin, Weyerhaeuser Timber Company, Tacoma, Wash.

3. "Trends in Utilization and Their Influence on Management Practices in the Central Hardwood Region." Roy

C. Brundage, Department of Forestry and Conservation, Purdue University, Lafayette, Ind.

4. "Forest Utilization and Management Practices in Bottomland Hardwoods." John A. Putnam, Southern Forest and Range Experiment Station, Delta Branch, Stoneville, Miss.

5. "Hardwood Control *vs.* Hardwood Utilization in the Southern Pine Region." R. A. Hertzler, Asheville, N. C. and L. E. Chaiken, Charleston, S. C.

Division of Forest Recreation

Friday Morning, December 15
9:00 a.m.

1. "The Place of Forest Recreation in the American Foresters' Professional Field." Speaker to be announced.

2. "Forest Recreation as an Economic and Business Asset." James L. Bossemeyer, National Association of Travel Officials, Washington, D. C.

3. "The Public's Interest and Responsibilities in Forest Recreation on Privately-Owned Forest Lands." Arthur C. Elmer, Michigan Department of Conservation, Lansing, Mich.

4. "Report of the National Recreation Policies Committee." James J. Goulden, Tennessee Valley Authority, Knoxville, Tenn.

Friday Afternoon, December 15
2:00 p.m.

1. "Forest Recreation in the Next Fifty Years." John Sieker, Division of Recreation and Lands, U. S. Forest Service, Washington, D. C.

2. "Comparisons Between Wild Land Forest Recreation and Urbanized City or Rural 'Park' Recreation." James H. Tyndall, Forest Preserve District, Cook County, Ill.

3. "Harmonizing Forest Recreation in Multiple Use of Forests." Bernard Frank, Division of Forest Influences, U. S. Forest Service, Washington, D. C.

4. "Some Major Principles in Recreation Land Use Planning." J. V. K. Wagar, Division of Forestry and Range Management, Colorado A & M College, Fort Collins, Colo.

Division of Forest-Wildlife Management

Friday Afternoon, December 15
2:00 p.m.

1. "Planning for Wildlife on a Management Forest." Kenneth A. Reid, Whitney Industries, Inc., Sabbatis, N. Y.

2. "Integrating Stand Improvement and Habitat Improvement." C. V. Severinghaus, New York Conservation Department, Albany, N. Y.

3. "Forest Wildlife Management in Pennsylvania." C. C. Freeburn, Pennsylvania Game Commission, Harrisburg, Pa.

4. "Big Game Management on Cooperative Wildlife Areas." Malcolm G. Edwards, North Carolina Wildlife Resources Commission, Raleigh, N. C.

5. "Cooperative Game Management on Virginia National Forests." C. F. Phelps and James Thornton, Virginia Commission of Game and Inland Fisheries, Richmond, Va.

6. "Habitat Improvement—An Integral Part of Forest Management." P. A. Herbert, Division of Conservation, Michigan State College, East Lansing, Mich.

Division of Private Forestry

Friday Morning, December 15
9:00 a.m.

Panel: Subject 1—"Private Forestry for Fifty Years."
Subject 2—"Private Forestry Looks Ahead."
Moderator, Charles Gillett, Washington, D. C.

1. "As Viewed by the Paper Industry."

Subject 1—E. A. Sterling, Montrose, Pa.

Subject 2—David Campbell, Camden, Ark.

2. "As Viewed by the Lumber Industry."

Subject 1—Norman Jacobson, Tacoma, Wash.

Subject 2—William Hagenstein, Portland, Oreg.

3. "As Viewed by a Forest Landowner."

Subject 1—Russel Watson, Manistique, Mich.

Subject 2—Julian McGowin, Chapman, Ala.

Friday Afternoon, December 15
2:00 p.m.

Panel: Subject 1—"Private Forestry for Fifty Years."
Subject 2—"Private Forestry Looks Ahead."
Moderator: M. H. Collet, New York, N. Y.

1. "As Viewed by a State Forester."

Subject 1—F. W. Besley, Laurel, Md.

Subject 2—F. G. Wilson, Madison, Wis.

2. "As Viewed by U. S. Forest Service."

Subject 1—Dahl Kirkpatrick, Albuquerque, N. Mex.

Subject 2—Arthur R. Spillers, Washington, D. C.

3. "As Viewed by an Extension Forester."

"Farm Forestry for 50 years," Woodbridge Metcalf, Berkeley, Calif.

"Farm Forestry Looks Ahead." Kenneth E. Barraclough, Durham, N. H.

Division of Public Relations

Wednesday Evening, December 13
7:30 p.m.

Pre-Meeting Get Acquainted Session.

"Who's Who and Here." Floyd E. Carlson, Chairman.

"For Your Consideration." J. H. Kitchens, Jr., vice chairman.

Friday Morning, December 15
9:00 a.m.

Theme: How To Do — PR

1. "Motion Pictures—How to Put Them Together, with Special References to Television." Speaker: Larry Sherwood, vice president in charge of production, Calvin Co., Kansas City, Mo.

Panel: H. J. Malsberger, chairman; Southern Pulpwood Conservation Association, Atlanta, Ga.; Hart S. Cowperthwait, Federal Communications Commission, Washington, D. C.; Herrin F. Culver, Visual Information Section, Soil Conservation Service, Washington, D. C.; Clint Davis, Division of Information and Education, U. S. Forest Service, Washington, D. C.

2. "Visual Aids—How to Make and Use Them." Speaker: Donald G. Williams, Audio-Visual Center, Syracuse University, Syracuse, N. Y.

Panel: Arthur K. Roberts, chairman; West Coast Lumbermen's Association, Portland, Oreg.; James C. McClellan, American Forest Products Industries, Washington, D. C.; J. Howard Mendenhall, Brandywine Valley Association, West Chester, Pa.

3. "The Editor Views Your News." Speaker to be announced.

Panel: Ron Richardson, chairman; American Forest Products Industries, Washington, D. C.; Frank A. Connolly, U. S. Forest Service, Philadelphia, Pa.; Albert G. Hall, editor, JOURNAL OF FORESTRY, Society of American Foresters, Washington, D. C.; Michael Hudoba, *Sports Afield*, Washington, D. C.; J. L. Van Camp, Canadian Forestry Association, Montreal, Quebec, Canada.

Luncheon, Friday, December 15

"Simplification of Technical Subjects for Non-Technical Audiences." Marlin H. Bruner, Extension Division, E. I. du Pont de Nemours & Co., Clemson, S. C.

Friday Afternoon, December 15
2:00 p.m.

1. "Radio Interviewing in Program Building." Speaker; Thomas J. Page, formerly Agricultural Director of station WNBC, Radio City, New York, N. Y.

Panel: Bill Bergoffen, chairman; Division of Information and Education, U. S. Forest Service, Washington, D. C.; A. R. Bond, Maryland Department of State Forests and Parks, Annapolis, Md.; Glen R. Durre'l, Department of Forestry, Oklahoma A & M College, Stillwater, Okla.; Earl Godwin, National Broadcasting Company, Washington, D. C.

2. "Planning a Human (Public) Relations Program." Speaker: Albert Arnst, Department of Public Information, Weyerhaeuser Timber Company, Tacoma, Wash.

Panel: W. R. Hine, chairman; U. S. Forest Service, Atlanta, Ga.; B. E. Allen, Union Bag and Paper Corp., Savannah, Ga.; C. S. Herr, Brown Company, Berlin, N. H.; John P. Shea, Division of Field Studies and Training, Extension Service, Washington, D. C.; Margrete S. Kienast, Division of Information and Education, U. S. Forest Service, Washington, D. C.

3. Chairmen's Report. Floyd E. Carlson, Associate Professor of Forest Extension, State University of New York, College of Forestry, Syracuse, N. Y.

4. "Study of Forestry Public Relations." Committee Report. Albert Arnst, chairman; Weyerhaeuser Timber Company, Tacoma, Wash.; Charles S. Cowan, Washington Forest Fire Association, Seattle, Wash.; William S. Swingler, U. S. Forest Service, Philadelphia, Pa.; Albert Wiesendanger, Keep Oregon Green Association, Salem, Oreg.; James C. McClellan, American Forest Products Industries, Washington, D. C.; Charles L. Tebbe, U. S. Forest Service, Washington, D. C.

5. "Proposed—A Forestry Educational Congress." J. H. Kitchens, Jr., vice chairman, Division of Public Relations.

Division of Range Management

Friday Morning, December 15
9:00 a.m.

Theme: "Half a Century of Progress in Range Management and a Look Ahead."

1. "Development of Range Management Philosophy and its Relationship to Land Use." W. R. Chapline, Division of Range Research, U. S. Forest Service, Washington, D. C.

2. "Range Management Education." Arthur W. Sampson, School of Forestry, University of California, Berkeley, Calif.

Discussion led by J. Lee Deen, Division of Forestry and Range Management, Colorado A & M College, Fort Collins, Colo.

Friday Afternoon, December 15
2:00 p.m.

Theme: "New Frontiers—A Look Ahead."

Panel: Discussion led by Raymond Price, Southwestern Forest and Range Experiment Station, Tucson, Ariz.

1. "Extension of the Range Front to the South and Southeast," R. S. Campbell, Southern Forest and Range Experiment Station, New Orleans, La.

2. "Opportunities and Needs in Range Management." Vernon A. Young, Texas A & M College, College Station, Tex.

3. "New Trends in Standards of Range Use." Kenneth W. Parker, Division of Range Research, U. S. Forest Service, Tucson, Ariz.

4. "New Trends in Range Soils." W. G. McGinnies, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

5. "New Trends in Range Reseeding." George Stewart, Intermountain Forest and Range Experiment Station, Ogden, Utah.

6. "New Trends in Control of Noxious Range Plants." George E. Glendening, Southwestern Forest and Range Experiment Station, Tucson, Ariz.

Division of Silviculture

Wednesday Evening, December 13
8:00 p.m.

1. "What Is Adequate Training in Silviculture?" Panel.

2. "Is There a Common Foundation for All Adequate Training in Silviculture, and Could a National Examination Be Build to Test Such Adequateness?" Panel.

3. "Forestry Problems of the Adirondacks." John R. Curry, Northeastern Forest Experiment Station, Paul Smiths, N. Y.

4. "An Economical Method of Marking Timber." W. S. Bromley, American Pulpwood Association, New York, N. Y.

5. "The Chemical Control of Inferior Species in the Management of Loblolly Pine." L. E. Chaiken, Southeastern Forest and Range Experiment Station, Charleston, S. C.

6. "Use of Petroleum Products as a Selective Herbicide in Southern Pine Seedbeds." F. M. Cossitt, U. S. Forest Service, Atlanta, Ga.

7. "Combatting Forest Pests by Education." Henry I. Baldwin, Forestry and Recreation Commission, Concord, N. H.

Friday Morning, December 15
9:00 a.m.

(*Joint meeting with Division of Forest Economics. See program listed for that Division.*)

Friday Afternoon, December 15
2:00 p.m.

1. "Reforestation of Strip-mined Coal Lands in Pennsylvania." W. C. Bramble, Department of Forestry, Pennsylvania State College, State College, Pa.

2. "Justifications for Forest Pruning in the Northeast." D. B. Cook, New York State Conservation Department, Albany, N. Y.

3. "From Field to Forest—A 50-year Record." Daniel DenUyl, Department of Forestry, Purdue University, Lafayette, Ind.

4. "Silvicultural Aspects of the Economic Management of Yellow-poplar." Torkel Holsoe, Division of Forestry, West Virginia University, Morgantown, W. Va.

5. "Interim Stocking Guides for Upland Central Hardwoods Management." Leon S. Minckler, Central States Forest Experiment Station, Carbondale, Ill.

6. "Are Natural Areas Essential." John F. Shanklin, Office of Land Utilization, U. S. Department of the Interior, Washington, D. C.

Division of Watershed Management

Friday Morning, December 15
9:00 a.m.

1. "The First Fifty Years." Raphael Zon, St. Paul, Minn.

2. "Watershed Aspects of the New York Water Supply Problem." Charles R. Hursh, Southeastern Forest and Range Experiment Station, Asheville, N. C.

3. "Plant and Soil Water Relations on the Watershed." Paul J. Kramer, Duke University, Durham, N. C.

4. "Problems for Watershed Soils Research." Marvin Hoover, Southeastern Forest and Range Experiment Station, Union, S. C.

Friday Afternoon, December 15
2:00 p.m.

1. "The Work of the Water Resources Policy Commission." Leland

. will be presented.

Olds, Water Resources Policy Commission, Washington, D. C.

2. "Range and Watershed Management in the Rio Grande." C. L. Forsling, U. S. Department of the Interior, Albuquerque, N. Mex.

3. "Watershed Management as Practiced by State Forestry Departments." Joseph F. Kaylor, Maryland Department of State Forests and Parks, Annapolis, Md.

4. "Watershed Management in the Flood Control Surveys." H. G. Wilm, U. S. Forest Service, Portland, Oreg.

5. "The Next Fifty Years." E. N. Munns, Division of Forest Influences, U. S. Forest Service, Washington, D. C.

Section Delegates

Section delegates will meet at 10:30 a.m., Wednesday, December 13 and that afternoon will meet with the Council at 2:00 p.m. to consider important administrative procedures, policies, and programs. Since such meetings were inaugurated, the representation of Sections has been nearly 100 percent.

The Council will meet on Wednesday morning, Wednesday evening, and in additional sessions as required.

Ladies Activities

Mrs. Gifford Pinchot will be hostess to ladies attending the Golden Anniversary Meeting at a tea at her home, 1615 Rhode Island Avenue, N. W. from 4:00 to 6:00 p.m. on Thursday, December 14.

A tour to Mt. Vernon and other points of interest has been arranged for ladies on Friday, December 15. Expenses will be shared. Chartered buses will leave the Mayflower Hotel at 10:00 a.m. and return at approximately 3:00 p.m. Ladies are also particularly invited to attend the dinner-dance at 7:30 p.m. that evening.

Related Meetings

A meeting of the Council of Forestry School Executives will be held at the Mayflower Hotel on December 17 and 18.

Alumni gatherings have been scheduled for Thursday evening, December 14. All alumni groups will make their own arrangements for meeting places, meals, and pre-meeting publicity of their reunions.

Forestry movies will be shown at 8:00 p.m. on December 14 for all who wish to see them.

Meeting Committees

George R. Phillips is the chairman of the committee for the Golden Anniversary Meeting. Working with him are three assistant general chairmen in charge of arrangements. They are Milton M. Bryan, Washington Section; A. R. Bond, Allegheny Section; and Wm. E. Cooper, Appalachian Section. Sub-committee chairmen are: Publicity, C. W. Mattison; Information and Welcome, H. R. Josephson; Dinner-Dance, J. H. Johnson; Golden Anniversary Favors, D. E. Hess; and Ladies Entertainment, Mrs. E. N. Munns. Members of the committee to plan the general sessions are Tom Gill, Herbert McKean, H. C. Buckingham, John F. Shanklin, and E. C. Crafts.

Hotel Accomodations

All members who have not already requested hotel room reservations are urged to do so at once. **Use the reservation card provided with the September issue of the *Journal*. Hotels at which reservations are being accepted, together with room rates, were listed in the September issue of the *Journal* and again below.**

The Mayflower Hotel, Connecticut Avenue and DeSales Street, is the headquarters for the meeting, with the general sessions, dinner-dance, and most of the Division meetings being held there. However, the Mayflower cannot accommodate all members. Accordingly, arrangements have been made with suitable nearby hotels to make rooms available for members attending the Golden Anniversary Meeting. Most of these hotels are shown on the accompanying map. Taxi fare from hotels not within walking distance is 30 cents, individual rate, or 20 cents, group rate.

Listed below are hotels where reservations can be made through the office of the Society of American Foresters, 825 Mills Building, Washington 6, D. C. All rates quoted are for rooms with bath. In addition to rooms with single, double, or twin beds, most hotels can provide suites.

Mayflower Hotel, Connecticut Avenue and DeSales Street, N. W. Single, $5.50, $6.50, $7.00, $7.50, $8.50; double, $10.00, $10.50, $11.50, $12.50; twin, $10.50, $11.50, $12.00, $13.00, $14.00, $16.00.

Martinique Hotel, 16th and M Streets, N. W. Single, $4.00, $5.00, $6.00; double, $6.00, $7.00, $8.00; twin, $7.00, $8.00.

The Lee House, 15th and L Streets, N. W. Single, $5.00, $5.50, $6.00, $7.00; double, $8.50, $9.00, $9.50; twin, $7.00, $8.00.

Hotel Statler, 16th and K Streets, N. W. Single, $5.00 to $12.00; double, $8.00 to $13.00; twin $9.50 to $14.50.

Lafayette Hotel, 16th and I Streets, N. W. Single, $4.00, $5.00; double, $7.00; twin, $8.00.

Hay-Adams House, 16th and H Streets, N. W. Single, $5.00, $6.00, $7.00; double, $7.00, $8.00; twin, $8.00, $9.50.

Roger Smith Hotel, 18th and Pennsylvania Avenue, N. W. Single, $4.50 to $7.00; double, $6.00 to $9.00; twin, $6.50 to $9.50.

Burlington Hotel, 1120 Vermont Avenue, N. W. Single, $5.00; double, $8.00; twin, $8.00.

Hamilton Hotel, 14th and K Streets, N. W. Single, $4.25, $4.75, $5.25, $5.75; double, $6.75, $7.75; twin, $7.75, $8.25.

Ambassador Hotel, 14th and K Streets, N. W. Single, $4.00, $4.50, $5.00, $6.00; double, $7.00, $7.50, $8.00, $8.50, $9.00; twin, $8.00, $8.50, $9.00, $10.00.

Hotel Annapolis, 12th and H Streets, N. W. Rates not to exceed: Single, $5.00; double, $7.50; twin, $7.50.

Harrington Hotel, 11th and E Streets, N. W. Single, $4.00; double, $6.00, $6.50; twin $7.50.

Raleigh Hotel, 12th and Pennsylvania Avenue, N. W. Single, $4.50, $5.00, $5.50, $6.00, $6.50, $7.50; double $6.50, $7.00, $7.50, $8.00, $9.00, $10.00, $11.00; twin, $8.00, $9.00, $10.00, $11.00, $12.00.

Roosevelt Hotel, 16th and Florida Avenue, N. W. Single $4.00, $5.00, $6.00, $7.00; double, $6.00, $7.00,

Map used through courtesy of American Automobile Association.

$8.00, $9.00; twin, $7.00, $8.00, $9.00, $10.00.

Some hotels provide group rates for from three to eight persons. Because single rooms will be limited, all members are encouraged to team up when possible.

Confirmation of reservations will be mailed direct to members by the hotel where space is reserved.

The first general session of the meeting begins at 9:30 a.m., Thursday, December 14, and the final session closes at noon, Saturday, December 16, 1950. Meetings of the Division of Education, Section delegates, and the Council will be on Wednesday, December 13.

Coming Events

Canadian Society of Forest Engineers

The 1950 annual meeting of the Canadian Society of Forest Engineers will be held on October 26, 27, and 28 at Sault Ste. Marie, Ontario.

Mr. Charles A. Rowe is chairman of the C. S. F. E. annual meeting committee. His address is Algoma Central Terminal Building, Bay Street, Sault Ste. Marie, Ontario.

Military Men Urged to Visit Society Units

As a result of the conflict in Korea, several Society members are now on temporary duty with the armed forces. The Council urges these men to attend the meetings of the Sections and Chapters in the locality wherever they might be stationed in the United States. Such attendance will enable them to become familiar with the forestry situation in other parts of the country.

Most members on temporary military duty prefer to maintain active participation in the Society for it affords them an opportunity to keep up to date on forestry developments during their absence from their regular positions. However, pursuant to Bylaw 39, Society members may request inactive status during temporary service with their nation's armed forces if they wish to do so.

Such status commences on the date that a request for inactive status is granted. For a member whose dues for the current year have been paid, the unused portion of the dues for the remainder of the year will be credited to his account and will be applied toward dues for the year in which he is restored to active status. Members whose dues for the current year have not been paid are eligible to apply for inactive status while serving in the armed forces, but dues for the period for which they are in arrears (not to exceed one-half year) must be paid before restoration to active status can be completed. In all cases, it is advisable to have one's dues paid to date before applying for inactive status.

Members on inactive status do not receive Society publications nor are they permitted to vote, but their attendance at Section and Chapter meetings is encouraged. All members on military duty in the vicinity of Washington, D. C. are particularly invited by the Council to attend the Golden Anniversary meeting on December 13 to 16, 1950.

Deadline Near for Consultant Listing

Consulting foresters who wish to have their names included in the Society's January 1951 List of Consulting Foresters should apply to the Society office prior to November 1, 1950.

Consultants applying for listing should provide name, address, territory, and specializations, following the form used in the last list which was published in the January 1950 JOURNAL OF FORESTRY.

Consultants whose listings appeared in the previous list and who have not yet returned inquiry cards received in September should do so at once.

Ballots on Three Topics Scheduled for November

A referendum on the reorganization of forest and range activities in the federal government, authorized by the Council in its June meeting, will be one of three issues on which the membership will be asked to ballot in November. Other subjects considered will be the Council's proposal to establish a Student Member grade of membership and the Council's proposal to revise the requirements for the Affiliate and Junior grades of membership.

Several Sections have already passed resolutions in regard to the report of the Commission on Organization of the Executive Branch of the Government, and the November referendum will give all members an opportunity to assist in shaping policies for the administration of federal forest and range lands.

The Student Member proposal offered by the Council would allow Junior and Senior forestry students at accredited schools to become Student Members of the Society upon the payment of $3.00 per calendar year. Membership would entitle them to receive the JOURNAL OF FORESTRY and to be admitted to the Junior grade upon graduation without the payment of the usual $5.00 admission fee nor the first year's dues in the Junior grade. The referendum will not consider the advisability of establishing Student Branches at accredited forestry schools, inasmuch as the Council voted in June that Student Branches be not approved.

Revision of the requirements for the Affiliate and Junior grades, the subject of the third ballot, would limit those eligible for the Junior grade to the graduates of approved curricula at accredited forestry schools and to Affiliate Members who had been in that grade for a minimum of two years. Graduates of non-accredited forestry schools, if they had completed all courses included in approved curricula, would be eligible immediately for election to the Affiliate grade, as well as persons with the required amount of practical experience.

Refer to pages 366 to 369 of the August JOURNAL OF FORESTRY for further details regarding these issues.

Southeast Arkansans Meet at Crossett

Seventy-five members of the Southeast Arkansas Chapter convened at the Crossett Experimental Forest, a branch of the Southern Forest Experiment Station, on August 7 for their regular bi-monthly meeting. Chairman T. R. Moberg presided.

Charles X. Grano of the Crossett Experimental Forest staff conducted the group on a tour of inspection of some of the newer experiments underway. The group viewed and discussed the seed tree area which is part of the large pilot plant study comparing even-aged and uneven-aged systems of management in the shortleaf-loblolly pine-hardwood type. They also saw the newly installed hardwood control study testing the use of Ammate using various methods of application and 2, 4, 5-T sprayed on the lower portion of tree trunks. The third stop gave the group an opportunity to view upland hardwood management experimental plots. The field trip was concluded at the release cutting plots where the group was brought up-to-date on returns and volumes removed in thinnings on areas on which pine was released from overtopping hardwoods in varying degrees ten years ago.

Queries and Quotes

Izaak Walton League of America, Inc.
31 No. State Street
Chicago 2, Illinois
July 31, 1950

Mr. Henry Clepper
Society of American Foresters
Mills Building
Washington, D. C.

Dear Henry:

The 50th anniversary of the Society of American Foresters represents an important landmark in the history of the conservation movement. All foresters can review with pride the important accomplishments of their Society since its humble beginning in Gifford Pinchot's home. Not only did it pioneer in the establishment of our first group of technical conservationists, but the idealism of your founders set the pace for most of our early victories in forest conservation.

On behalf of the Izaak Walton League of America I want to extend to the whole Society of American Foresters our sincere congratulations and good wishes for the future. May you continue to furnish strong leadership needed to defend and expand our resource conservation movement.

Yours sincerely,
William Voigt, Jr.
Executive Director

Candidates for Membership

Candidates for membership whose applications were received in the Society office prior to September 1, 1950 are listed below. Names, positions, addresses, and education are given.

Action regarding the eligibility of these candidates will be taken by the Council as of November 1, 1950. Comments, protests, or important information regarding the qualifications for membership of candidates listed are invited from present voting members. All such communications are kept strictly confidential, being used only by the Council in taking final action on applications. Correspondence should be received in the Society office prior to November 1, 1950.

The names of those candidates who are elected will be published in the Society Affairs department of the December 1950 JOURNAL OF FORESTRY. The names of those who signify their acceptance of election will be published in subsequent issues of the JOURNAL.

Allegheny Section

Junior Grade

Salt, A. A., Sales Engr., American Lbr. & Treating Co., Baltimore, Md.; Univ. of Ga., B.S.F., 1947.

Slade, R. S., Soil Cons. Aid, S.C.S., Woodbury, N. J.; Rutgers Univ., B.S., 1948; Duke, M.F., 1949.

Appalachian Section

Junior Grade

Edwards, A. C., Univ. Sta., Charlottesville, Va.; N. C. State, B.S.F., 1950.

Gross, R. W., 205 Ashe Ave., Raleigh, N. C.; N. C. State, B.S.F., 1950.

Moon, E. C., 101 S. Laurel Ave., Charlotte, N. C.; N. C. State, B.S.F., 1950.

Affiliate Grade

Smith, F. W., Dist. Supt., Int. Paper Co., Wilmington, N. C. Appalachian.

Central States Section

Junior Grade

Buttke, E. A., Park Mgr., Mich. Dept. of Cons., Pinckney, Mich.; Mich. State, B.S.F., 1942. Reinstatement.

Carome, C. J., 2192 Edgewood Rd., Cleveland Heights, Ohio; N. Y. State, B.S.F., 1950.

Hasford, C. G., 326 2, West State St., West Lafayette, Ind.; Purdue, B.S.F., 1950.

Walker, R. S., 651 State St., Hammond, Ind.; Purdue, B.S.F., 1950.

Columbia River Section

Junior Grade

Higinbotham, D. D., 1713 Harrison Drive, Astoria, Oreg.; Oregon State, B.S.F., 1950.

Martin, J. R., 630 25th Ave., Longview, Wash.; Iowa State, B.S.F., 1949.

Proud, O. R., Asst. Agent, Washington State Ext. Service, Kelso, Wash.; Univ. of Wash., B.S.F., 1936.

Richardson, J. H., Jewell Side Camp, Jewell, Oreg.; Oregon State, B.S.F., 1950.

Rowley, M. L., School of Forestry, Oregon State College, Corvallis, Oreg.; Oregon State, B.S.F., 1950.

Member Grade

Korte, Karl H., 3033 Oahu Ave., Honolulu, Hawaii. (Junior, 1935).

Gulf States Section

Junior Grade

Campbell, E. R., Lake, Miss.; Univ. of Fla., B.S.F., 1949.

Campbell, P. O., Tech. Forester, Int. Paper Co., Canton, Miss.; N. C. State, B.S.F., 1950.

Cann, J. J., Box 96, Pontotoc, Miss.; Univ. of Mich., B.S.F., 1937. Reinstatement.

Carter, R. T., Forester, Gaylord Container Corp., Bogalusa, La.; La. State, B.S.F., 1950.

Corn, E. F., Forester, Gaylord Container Corp., Bogalusa, La.; N. C. State, B.S.F., 1949.

Moore, L. J., McLourine St., Sardis, Miss.; Pa. State, B.S.F., 1941.

Stranan, L. C., Ext. Forester, Miss. Ext. Service, Brookhaven, Miss.; Miss. State, B.S.A., 1914.

Strong, O. B., 328 W. Cherokee St., Brookhaven, Miss.; La. State, B.S.F., 1950.

Thigpen, D., Forester, Gaylord Container Corp., Bogalusa, La.; La. State, B.S.F., 1949; M.S., 1950.

Affiliate Grade

Guice, W., Surveyor and Field Asst., International Paper Co., Jackson, Miss.

Inland Empire Section

Junior Grade

McDonald, C. A., Tbr. Mgmt., U.S.F.S., Coeur d'Alene, Idaho; Mont. State, B.S.F., 1949.

Kentucky-Tennessee Section

Junior Grade

Batsen, J. O., Univ. of the South, Sewanee, Tenn.; Vanderbilt Univ., B.A., 1948; Yale, M.F., 1950.

New England Section

Junior Grade

Thornton, P. L., 64 High St., Claremont, N. H.; N. Y. State, B.S.F., 1949; M.F., 1950.

New York Section

Junior Grade

Anderson, G. L., 30 Main St., Saranac Lake, N. Y.; N. Y. State, B.S.F., 1949; M.F., 1950.

Church, C. M., 139 Park Ave., Lowville, N. Y.; N. Y. State, B.S.F., 1950.

Stickney, R. A., 17 Elm St., Saranac Lake, N. Y.; N. Y. State, B.S.F., 1950.

Verbeck, A. R., 604 Univ. Ave., Syracuse, N. Y.; N. C. State, B.S.F., 1950.

Associate Grade

Touchstone, J. H., Field Tech., Sandvik Saw & Tool Co., 47 Warren St., N. Y., N. Y.

Northern Rocky Mountain Section

Junior Grade

Beltzer, C. E., Jr., Washoe, Mont.; Mont. State, B.S.F., 1950.

Hegland, A. W., Rt. 3, Missoula, Mont.; Mont. State, B.S.F., 1950.

Member Grade

Godfrey, H. W., Box 17, U.S.F.S., Seeley Lake, Mont.; Univ. of Mont., B.S.F., 1939. (Junior, 1945).

Ozark Section

Junior Grade

Erwin, H. K., Jr., 8 McBraine, Columbia, Mo.; Univ. of Mo., B.S., (Forestry), 1949.

Wehking, E. F., 309 S. 5th., Columbia, Mo.; Univ. of Mo., B.S., (Forestry), 1949.

Wylie, J. E., Box 157, Warrenton, Mo.; Oregon State, B.S.F., 1949.

Puget Sound Section

Junior Grade

McCloskey, L. F., 1316 E. First St., Port Angeles, Wash.; Univ. of Wash., B.S.F., 1941.

McCormack, H. E., Forestry Aid, U.S.F.S., Glacier, Wash.; Univ. of Wash., 1940.

Member Grade

Berg, A. B., Rt. 2, Box 376 E., Bothell, Wash. (Junior, 1944).

Clentor, F. W., 2406 Baker St., Olympia, Wash.; Univ. of Minn., B.S.F., 1908. Reinstatement.

Handy, J. E., Box 768, Okanogan, Wash. (Junior, 1944).

Imhof, C. F., 6720 1st Ave., N. E., Seattle, Wash. (Junior, 1944).

Lauterbach, P. G., Research Forester, Weyerhaeuser Tbr. Co., Centralia, Wash. (Junior, 1945).

Turay, M. C., 521 Broadway West, Montesano, Wash. (Junior, 1944).

Southeastern Section

Junior Grade

Allen, H. P., P.O. Box 122, Camilla, Ga.; Univ. of Ga., B.S.F., 1938.

Borden, C. F., Bonifay, Fla., Univ. of Fla., B.S.F., 1950.

Comer, F. G., Jr., 3012 Dodd St., Godsden, Ala.; Colo. A & M., B.S.F., 1949.

Farr, M. W., Ga. Forestry Comm., Macon, Ga., Univ. of Ga., B.S.F., 1949.

Lewis, W. T., Mill Pond Plantation, Thomasville, Ga.; Univ. of Fla., B.S.F., 1950.

Locke, W. J., 218 Anthony Rd., Ocala, Fla.; Univ. of Fla., B.S.F., 1950.

Associate Grade

Ernest, J. T., Fie'd Asst., Int. Paper Co., Panama City, Fla.

Southwestern Section

Junior Grade

Perry, E. L., Asst. Regional Forester, U.S.F.S., Albuquerque, N. Mex.

Summerly, J. J., Forestry Aid, U. S. Dept. of Interior, Whiteriver, Ariz.; Univ. of Calif., B.S.F., 1949.

Member Grade

Smith, Z. G., Forester, U.S.F.S., Albuquerque, N. Mex. (Junior, 1947).

Upper Mississippi Valley Section

Junior Grade

Ingram, D. O., Grand Marais, Minn.; Univ. of Minn., B.S.F., 1950.

Lukkarila, R. W., 8 First St., Chisholm, Minn.; Univ. of Minn., B.S.F., 1950.

Warner, P. W., 124 N. 56th Ave., Duluth, Minn.; Univ. of Minn., B.S.F., 1950.

Affiliate Grade

Hopia, B., Tbr. Appraiser, Minn. Forest Service, Warroad, Minn.

Wisconsin-Upper Michigan Section

Junior Grade

Holt, G. G., Forester, Wis. Cons. Dept., Wisconsin Rapids, Wis.; Mich. State, B.S.F., 1950.

Jensen, E. P., Forester, Griffith State Nursery, Wisconsin Rapids, Wis.; Mich. State, B.S.A., 1950.

Steinbrenner, E. C., Soils Dept., Univ. of Wis., Madison, Wis.; Univ. of Minn., B.S.F., 1949.

Tobin, W. T., Seney, Mich.; Mich. State, B.S.F., 1950.

Turinski, C., Box 212 Wautoma, Wis.; Iowa State, B.S.F., 1949.

Foreign

Corresponding Grade

Wijkstrom, S., Swedish Match Co., Jenkoping, Sweden.

Candidates Elected

The following persons were elected to the indicated grades of membership by the Council on September 1, 1950.

Junior Grade

Adams, W. J.
Albright, T. B.
Allen, J. C.
Allen, T. R., Jr.
Allender, H. E.
Anderes, H. F.
Anderson, A. E.
Anderson, A. G.
Anderson, A. M.
Anderson, R. C.
Andrews, C. W.
Apperson, A. J.
Arader, H. E.
Armstrong, L. W.
Aspinwall, L. G.
Auman, D. I.
Austin, C. F.
Ayling, A. T.
Babb, J. R.
Badertscher, R. L.
Baldwin, A. G.
Barker, W. K.
Barnes, C. C.
Barnes, W. R.
Barnickol, H. J.
Batten, C. R.
Baum, J. V., Jr.
Beckwith, S. L. (re)
Beisel, D. V.
Berger, A. G.
Bernstsen, C. M.
Berquist, D. G.
Berry, W. R.
Black, R. S.
Blaisdell, G. M., Jr.
Bline, D. F.
Block, A. F.
Blomquist, T. W.
Bo'z, R. C.
Boserman, R. W.
Bowlby, R. E.
Broadwell, W. C.
Brown, G. M.
Buckman, R. E.
Burns, R. M.
Bury, R. L.
Buschena, A. J., Jr.
Butler, A. P., Jr.
Campbell, A. D., Jr.
Carlson, R. W.
Carson, W. M.
Casad, B. C.
Chatten, L. R.
Cleaveland, E. C.
Clyde, J. F.
Coe, A.
Cole, D. E.
Co'grove, W. H., Jr.
Collier, H. G., Jr.
Collier, M. L.
Collins, J. M.
Conard, J. G.
Conlin, R. A.
Connell, T. L.
Cook, F. M.
Coroiewski, E. R.
Cummins, P. J.
Curry, C. A.
Curtis, L. B.
Darling, O. H., Jr.
Davis, R. F.
Davis, S. A.
Deane, J. A.
De Bruin, G. E.
Deets, N. A.
Dehls, R. B.
DeLeonardis, S.
Dexter, K. P.
DeWitt, W. A.
Disney, W. L.
Dockins, W. C.
Dodds, E. F., Jr.
Dorn, D. E.
Dowdell, S. A., III
Drake, R. T.
Edenfie'd, R. J.
Ellington, H. G.
Elliott, R. H.
Emery, R. B.
Engelhard, R. J.
Estes, L. F.
Evans, J. D.
Evans, W. L.
Felker, K. B.
Fetty, L. E.
Fickett, S. B., Jr.
Fink, C. R.
Finley, J. A.
Foley, R. P.
Forristall, F. F.
Foster, R. W.
Foxworthy, S. J.
Francis, J. M., Jr.
Frazier, G. D.
Frederickson, L. E.
Frese, R. B.
Gabriel, W. J.
Gabrielson, O. U.
Garofalo, J. J.
Ginquinto, E. J.
Gibson, K. B.
Gillett, J. E.
Gillie, R. E.
Gilmore, D. M.
Golden, E. A.

Grader, W. B.
Graham, E. D.
Gratkowski, H. J.
Griffith, R. F.
Gruener, C. J.
Gurnsey, V. L.
Haag, W. G.
Haislet, J. A.
Hale, E. H., Jr.
Hamilton, M. E.
Hanses, E. H.
Hardee, J. L.
Harkin, D. A.
Harrison, R. P., Jr.
Hartwick, R. A.
Hays, H. E.
Healt, G. A.
Heavrin, C. A.
Hembree, A. H., Jr.
Herbert, F. R.
Herron, L. E.
Hicks, W. S.
Hills, R. O.
Heard, T. E.
Horn, A. F.
Horton, L. E.
Houghton, H. A.
Howard, G. P., Jr.
Howell, W. H., Jr.
Howerton, D. L.
Hubbard, R. L.
Hunt, D. L.
Jacobson, A.
Jackson, H. R.
Jeffers, G. S.
Jimerson, J. R.
Johnson, H. R.
Johnson, T. J.
Johnson, T. J., Jr.
Johnson, V. J.
Jones, M. F.
Jordan, H. A.
Jungster, H.
Keister, T. D.
Keller, F. P.
Kennedy, J. J. B.
Klevorn, R. R.
Knight, M. J.
Knight, W. R.
Kolb, W. D.
Kornmeyer, E. J.
Kovatch, G. S.
Krul, P. F.
LaBonta, R. R.
Lacher, T. V.
LaMois, L. M.
Landeen, R. D.
Lanier, J. W., III
Larrabee, D. R.
Larson, L. H.
Leaf, A. L.
LeDosquet, R. H.
Lee, G. E.
Lemke, M. M.
LeProwse, R. E.
Lester, E. J.
Lewis, T. D.
Lindholm, V. V.
Lindsey, W. M.
Lipscomb, R. B.
Little, G. R.
Loranger, J. P.
Lorello, J. J.
Loveless, C. M.
MacDaniels, E. N.
Mackay, W. R.
Malsberger, H. J., Jr.
Marl, R. E.
Masters, H. M.
McClellan, R. W.
McCullers, A. G.
McGuire, D. H., Jr.
McGurn, D. J.
McLean, M. D.
McNees, W. A. (re)
McNeil, J. F.
Mendel, G.
Menke, C. H.
Meredith, D. W.
Merkle, J. R.
Merryman, S. G.
Mikell, H. K.
Miller, W. T.
Milligan, R. L.
Mills, H. C.
Minato, A. E.
Mitchell, R. W.
Moffett, P. S.
Morrissey, J. L.
Morrow, H. L.
Nagy, W.
Neel, W. L.
Nellis, J. W.
Nelson, F. B.
Nelson, H. A., (re)
Nelson, R. A.
Nelson, R. L.
Nickens, R., Jr.
Nielsen, M. C.
Nix, L. C.
Nordmann, L. H.
Odom, J. D.
Ogden, H. S.
O'Keefe, J.
Oliver, D. M.
Olney, L. G.
Olson, D. D.
Orach, S.
Orr, F. E.
Orr, J. V.
Orwig, H. L.
Otterbach, P. J.
Paldi, J. W.
Palmer, W. M.
Parker, J. R.
Patterson, J. W.
Pearson, J. R.
Pelkey, J. D., Jr.
Petersen, J. W.
Pike, C. C.
Pinkerton, J. B.
Plotkin, H. S.
Poole, J. W.
Porterfield, R. B.
Post, D. M.
Powell, L. W.
Pride, T. J.
Querin, H. M.
Ramsey, J. C.
Rankin, G. S., Jr.
Rardon, J. D.
Renaud, G. E.
Rieck, C. E.
Riley, J. J.
Riley, J. P.
Ring, R. L., Jr.
Robinson, D. B.
Robinson, W. L.
Roget, E. L.
Ross, T. E.
Ruch, R. J.
Rude, W. B.
Sanford, C. A.
Satterlee, R. E.
Schlick, W. T.
Schmitt, D. W.
Scribner, W. A.
Seaman, D. D.
Shavis, J. M.
Shelden, L. C.
Shoemaker, P. H.
Simmons, L. J.
Simpson, J. P.
Skinner, C. K.
Slade, S. M.
Spaeth, M. S.
Sparkman, W. L.
Stanley, L. S.
Statler, E. E.
Steers, W. F.
Sterrett, J. P.
Stevens, D. R.
Stewart, G. W.
Stewart, R. B.
Stineman, J. E.
Storms, G.
Swanson, F. C.
Tappan, W. C.
Taylor, N. W.
Tennant, K. E.
Thomas, E. A., Jr.
Thompson, P. M., Jr.
Thomsson, A. I.
Thrash, R. D.
Tift, R. H.
Trotter, S. C.
Trygar, R. W.
Turek, A. J.
VanCleef, E. B.
VanMeter, C. B.
Vande Linde, F.
Venishnick, J. C.
Vetter, W. T.
Voorhies, R. V.
Voyles, R. L.
Walker, B. C.
Warrick, C. L.
Watson, H. O., Jr.
Weaver, W. J., Jr.
Welker, L. J.
West, W. J.
White, L. C.
White, R. E.
Whitney, R. B.
Wiegand, W. E., Jr.
Williams, R. J.
Winter, A. V., Jr.
Winters, W.
Woodman, J. E., (re)
York, O. E.
Youngblood, G. B.
Yow, V.

Member Grade

App, J. M.
Bowker, G.
Church, J. W.
Ellis, I. D.
Jackson, T. B.
Kucera, L. J.
Lloyd, W. J.
McClintick, K. B.
Mottishaw, J. S.
Pierce, D. E.
Reed, F.
Richmond, H. H.
Schultz, C. D.

New Members and Advancements

The new members and members advanced in grade who are listed below are eligible for participation in the activities of the Society of American Foresters, including the meetings and projects of Sections, Chapters, Divisions, and Committees. They have submitted their applications for membership, properly endorsed, and have been declared eligible by the Council. By accepting election, these members have indicated their desire to assist the Society in the fulfillment of its objectives.

Allegheny Section

Junior Grade

Bevens, J. J., Box 541, Weston, W. Va.
Costley, R. J., U.S.F.S., Warren, Pa.
Grisez, T. J., U.S.F.S., Laurel, Md.
Hutnik, R. J., 102 Union St., Shickshinny, Pa.
Lyon, T. J., 49 Lincoln Ave., Hagerstown, Md.
Neely, O. O., Box 47, Ripley, W. Va.
Switzer, 456 Florida Ave., Chester, W. Va.
Vesper, C. A., 615 E. Second St., Bloomsburg, Pa.

Appalachian Section

Junior Grade

Frazier, J. R., Box 304, Newberry, S. C.
Noneman, R. L., 2106 White Oak Rd., Raleigh, N. C.

Central Rocky Mountain Section

Junior Grade

Bailey, W. F., 397 W. 23rd St., Durango, Colo.

Central States Section

Junior Grade

Boughner, W. S., 814 Egleston Ave., Kalamazoo, Mich.
Fellman, J. A., 1406 Kensington Ave., East Lansing, Mich.
Fisher, C. D., R.D. #3, Steubenville, Ohio
Gingrich, S. F., 153½ N. Main St., Harrisburg, Ill.
Green'aw, R. E., 13925 Ward Ave., Detroit, Mich.
Johnson, W. F., 1004 E. Main St., Crawfordsville, Ind.
Koehn, F. W., R.F.D., #3, Harbor Beach, Mich.
Roberts, D. E., 2750 E. 62nd St., Indianapolis, Ind.
Tobermann, 604 Jefferson St., Hillsboro, Ill.
VanGilder, P. B., 1387 Univ. Ave., Lincoln Park, Mich.
Woods, N. E., Linder Bldg., Charleston, Ill.

Member Grade

Bennett, H. D., 2799 Galbraith Rd., Cincinnati, Ohio
O'Neil, W. J., 223 W. Church St., Harrisburg, Ill.

Associate Grade

Laybourne, W., 235 S. Southampton, Columbus, Ohio

Columbia River Section

Junior Grade

Anderson, R. W., % Ochoco Nat'l Forest, Prineville, Oreg.
Childre, R. W., Gilchrist, Oreg.
Dalen, R. S., Gen. Del., Ocean Lake, Oreg.
Eversole, K. R., Rt. 3, Box 226, Kalamth Falls, Oreg.
Gump, T. E., Box 165, Oregon City, Oreg.
Isaacson, N. R., 821 Uglow St., Dallas, Oreg.
Keil, H. H., 8629 S. W. 41st Ave., Portland, Oreg.
Krell, R. K., 715 S. Pine St., Roseburg, Oreg.
Lewis, F. E., Mt. Adams Rgr. Sta., Trout Lake, Wash.
Lowther, M. E., 404 N. E. St., Philomath, Oreg.
Paisley, E. R., Rt. 1, Box 850, Veneta, Oreg.
Pearson, E. D., State Forestry Dept., Forest Grove, Oreg.
Rennels, R. G., Univ. of Illinois, Urbana, Ill.
Steig, G. G., 3611 Pacific Way, Longview, Wash.
Stickney, D. B., Powers, Oreg.
Wolf, M. F., U.S.F.S., Seneca, Oreg.
Worthington, R. E., U.S.F.S., Glide, Oreg.

Member Grade

Grant, J. E., Wisic Rt., Jewell, Oreg.
Helland, M. L., 220 S. 24th St., Salem, Oreg.
Layman, P. A., 702 Spruce, Klamath Falls, Oreg.

Associate Grade

Roth, L. F., Oregon State College, Corvallis, Oreg.

Gulf States Section

Junior Grade

Brewton, L. L., Jr., 1312 E. Maple St., Winnfield, La.
Brown, C. E., Box 36, Zwolle, La.
Compton, C. W., Box 436, Centreville, Miss.
Evans, F. L., 523 Poplar Ave., Philadelphia, Miss.
Hulett, A. D., Jr., 205 Second St., DeQuincy, La.
Price, J. H., III, Magnolia, Miss.
Roundtree, L. J., Box 304, Thibodaux, La.
Seale, J. W., Box 384, De Ridder, La.
Sumrall, J. E., 330 White Oak Drive, Minden, La.
Vick, H. M., Kellogg Lbr. Co., Inc., Monroe, La.

Member Grade

Howard, H. H., Jr., Johns Manville Products Corp., Natchez, Miss.
Mackay, D. E., Gen. Dev., Springhill, La.
McKillips, R. L., Box 550, Minden, La.
Summers, J. H., Walls, La.

Affiliate Grade

Hawkins, N. V., Box 672, Jena, La.
Holmes, J. L., Box 542, Winnfield, La.

Inland Empire Section

Junior Grade

Graham, D. P., N. 5114 Elgin St., Spokane, Wash.
Ree, C. D., 157 S. Howard St., Spokane, Wash.

Kentucky-Tennessee Section

Junior Grade

Gray, R. L., 639 13th St., Bowling Green, Ky.
Hill, R. C., Robinson Forest, Noble, Ky.

New England Section

Junior Grade

Nordin, V. J., Univ. of N. B., Fredericton, N. B.
Stebbins, 274 N. Pleasant St., Amherst, Mass.

New York Section

Junior Grade

Cookingham, W. S., Jr., College Hill, Clinton, N. Y.
Erwin, E. B., 40 Lafayette Ave., Middletown, N. Y.
Hollenbeck, G. N., Cape Vincent, N. Y.

Northern California Section

Junior Grade

Leatherman, R. L., Gen. Dev., Mt. Shasta, Calif.
Rappleye, R. E., 4619 Fegan Way, Sacramento, Calif.
Radcliffe, W. A., McCloud, Calif.
Walter, C. H., Box 685, Fortuna, Calif.

Member Grade

Stone, E. C., Univ. of Calif., Berkeley, Calif.

Associate Grade

Clark, E. C., Forest Insect Lab., Berkeley, Calif.

Northern Rocky Mountain Section

Junior Grade

Ammann, E. N., 738 E. Front St., Missoula, Mont.
Cech, F. C., 800 Eddy St., Missoula, Mont.
Damon, R. W., Box 876, Libby, Mont.
Freeman, F. R., Yellowstone Park, Wyo.
Hunter, H. C. A., U.S.F.S., Libby, Mont.
Lyman, J. R., U.S.F.S., Warland, Mont.
McGaw, W. W., Troy Rgr. Sta., Troy, Mont.
Nelson, F. A., Jr., Box 522, Libby, Mont.
Sieminski, J., % J. Neils Lbr. Co., Libby, Mont.
Smith, D. C., 2018 S. 7th West, Missoula, Mont.
Trickel, J. W., 401 Plymouth St., Missoula, Mont.
Vladimiroff, R. T., Yellowstone Nat'l Park, Wyo.

Ozark Section

Junior Grade

Bealke, S. W., Piedmont, Mo.
Church, J. B., 607 Sanford Place, Columbus, Mo.
Jones, J. H., Box 95, Strong, Ark.
Karow, K. F., U.S.F.S., Cassville, Mo.
Margrave, F. N., Jr., 304 W. 16th Ave., Pine Bluff, Ark.
Pakula, A. C., Gen Dev., Broken Bow, Okla.
Range, J. E., 411 E. Daniel, Piedmont, Mo.

Member Grade

Cain, R. L., 518 N. Cedar St., Little Rock, Ark.
Torgerson, G. H., 803 Crayton Ave., Gurdon, Ark.

Affiliate Grade

Nutt, C. C., Tinsman, Ark.

Puget Sound Section

Junior Grade

Hanchett, W. C., Gen. Dev., Forks, Wash.
Murray, L. T., Jr., West Fork Tbr. Co., Tacoma, Wash.
Wilcox, E. R., Rt. 1, Box 267, Montesano, Wash.

Southeastern Section

Junior Grade

Bremer, R. H., Gen. Dev., Baldwin, Fla.
Johnson, J. C., Univ. Sta., Gainesville, Fla.
Lopardo, F. A., Florida Forest Service, Madison, Fla.
McAllester, W. R., 413 Glenn Bldg., Atlanta, Ga.
Turner, W. F., 103 N. Jefferson Ave., Clearwater, Fla.

Southwestern Section

Junior Grade

Brewster, P. H., Jr., U.S.F.S., Flagstaff, Ariz.
Weissenborn, K. R., U.S.F.S., Jacobs Lake, Ariz.

Member Grade

Rea, R. E., Coconino Nat'l Forest, Flagstaff, Ariz.

Upper Mississippi Valley Section

Junior Grade

Amborn, E. R., 1149 Summit Ave., Detroit Lakes, Minn.
Anderson, R. L., Div. of Plant Path., St. Paul 1, Minn.
Jamrock, E. A., Box 311, Littlefork, Minn.
Johnson, H. B., 109 W. 3rd St., Park Rapids, Minn.
Nelson, L. O., 1929 St. Clair, St. Paul, Minn.
Runkel, S. T., Box 630, Ottumwa, Iowa.

Washington Section

Junior Grade

Kelly, W., 3724 Manor Rd., Chevy Chase, Md.

Wisconsin-Upper Michigan Section

Junior Grade

Cairns, F. E., Jr., Griffith State Nursery, Wisconsin Rapids, Wis.
Winner, Box 52, Keshena, Wis.

Forestry News

BLM Delegation Order Signed

Secretary of the Interior Oscar L. Chapman has signed a comprehensive delegation order which includes for the first time in one document the major responsibilities of the director of the Bureau of Land Management.

The Secretary also approved the redelegation of many of these matters to the bureau's regional administrators.

The delegation order gives the director authority to take all necessary actions, under public land statutes, including surveying and resurveying of the public lands; issuing mineral leases except potash and phosphate, and administration of grazing districts, and issuance of grazing leases on public lands outside grazing districts.

Other functions delegated are timber sales, not to exceed 40,000,000 board feet; sales of isolated or disconnected tracts of public land; the issuance of leases for public airports, for parks and recreation purposes; exchanges of land where the value of the selected land does not exceed $250,000; the issuance of patents for grants of land; and the issuance of leases with option to buy small tracts of land for homesite and business purposes, and the disposal of public lands for homesteading.

James A. Beal to Head Forest Insect Work

Dr. James A. Beal has been selected to head the U. S. Department of Agriculture's Division of Forest Insect Investigations.

Dr. Beal is returning to the department from Duke University School of Forestry where for the past 11 years he has taught forest entomology and conducted research on forest insect problems in the Southeast. He succeeds Dr. F. C. Craighead who retired last May after having served for 27 years as leader of the division. He will direct the bureau's forest insect work from headquarters at the Agricultural Research Center at Beltsville, Md. and through eleven field offices.

Donald E. Parker, assistant leader of the Division of Forest Insect Investigations for the past three years, will continue to serve in that capacity

Vessey Named Information Chief

James K. Vessey has been transferred from the Eastern Region, U. S. Forest Service to the regional forester's office in Missoula, Mont. as regional chief of information and education. Mr. Vessey succeeds Tom Van Meter who was transferred to the Intermountain Region, Odgen, Utah, last February.

Mr. Vessey is a graduate of Pennsylvania State College. In 1933, after 8 years of industrial and business experience in related forestry fields, he entered the U. S. Forest Service on the Allegheny National Forest in Pennsylvania. Subsequently he has served in various capacities in the Eastern Region, including district forest ranger forest supervisor's staff, regional office state and private forestry activities, and forest supervisor. For the last 5½ years, he has served as chief of information and education in the Eastern Region at Philadelphia, Pa.

Oak Wilt in Ozarks

Oak wilt is now widely distributed in southern Missouri and has reached the northern tier of counties in Arkansas.

Reporting on preliminary findings of a study now in progress in the Ozarks Dr. T. W. Bretz, forest pathologist of the U. S. Department of Agriculture, told the Railway Tie Association in Louisville, Ky., that results underscore the need for a vigorous research program to find control measures.

In making the study Dr. Bretz has the cooperation of the Missouri and Arkansas state forestry divisions, the Missouri Agricultural Experiment Station, the U. S. Forest Service, and commercial forest interests.

The largest area of infection observed in the survey is from 3 to 5 acres. Many of the infection centers in Missouri cover from a third to a half acre. Those observed in Arkansas are smaller. The fact that only a few trees from each stand are infected indicates that the disease has spread southward recently.

The preliminary findings reveal that oak wilt is generally prevalent through out the forested sections of southern Missouri. It was found in southern and central Missouri in 1949. This survey has disclosed locations in 13 additional counties. The disease is more prevalent in the eastern part of the Ozarks.

One of the most striking discoveries to come out of this survey is that giant oaks are the first to be stricken by the disease. Isolated infected trees found at scattered locations are either the dominant or codominant tree in the stand.

Dr. Bretz also reported that oak wilt has been identified in a new location—Cleveland, Ohio.

AAAS to Meet in December

The American Association for the Advancement of Science will hold its 117th meeting in Cleveland, Ohio, December 26 to 30. Programs will cover every principal field of science from astronomy and botany to, and including, zoology. All seventeen of the association's sections and subsections, and more than forty participating societies and organizations are completing plans for an aggregate of more than 200 sessions. An extensive tour to museums, laboratories, and industrial plants of the Cleveland area has been planned.

The Annual Science Exposition, in the arena of Cleveland's public auditorium will feature some 150 booths.

In the botanical and agricultural sections symposiums will be conducted on "The Structure and Analysis of Plant Communities," "The Ecological Basis of Evolution," " Plant Physiological Ecology," and "Soil Science and Its Relations to Geology and Geography."

University of Georgia Courses Given National Recognition

National recognition for meritorious work in cartography and photogrammetry was recently given the Department of Geography and Geology of the University of Georgia. It was stated that the department showed greater strength in undergraduate cartographic training than any others specializing in the subject.

The honors were conferred at the 46th annual meeting of the Association

of American Geographers held at Clark University, Worcester, Mass.

The Department of Geography and Geology of the University of Georgia, teaches all courses in cartography and photogrammetry taken by students in the Georgia School of Forestry. The course in photogrammetry, was designed in consultation with the Georgia School of Forestry faculty.

Forest Products Radio Permit Issued

The largest construction permit issued to date by the Federal Communications Commission in the "Forest Products Radio Service" frequency band was issued in August for a forestry communication system to be manufacturered and installed by Radio Specialty Manufacturing Company of Portland, Ore.

The system, operating on a frequency of 49.30 megacycles, is being installed for the J. Neils Lumber Company at Klickitat, Wash. It consists of one base station and 50 mobile units to be operated in Klickitat and Yakima Counties.

The allocation of frequency bands for the forest products industry was made only last year.

Simplified Form for Grazing Leases

A new simplified and combined form for application and lease of public grazing lands in the West has been issued September 9 by the Bureau of Land Management, U. S. Department of the Interior.

This lease form replaces four obsolete forms for action on grazing leases: (1) entire renewals, (2) partial renewals, (3) entire assignments, and (4) partial assignments.

The single document will reduce multiple handling of papers by both the public and the government. Although all BLM regions except Alaska will use the form, there is a special advantage to be gained in Region 1 where the O and C forests are administered in western Oregon.

For the first time in the history of the Department, authority for grazing on lands in western Oregon will be issued in one lease and in one action. In other words, a single document will cover both the Taylor Grazing Act Section 15 leases and the grazing leases in the O and C forest areas. Prior to this, an operator had to file a separate grazing lease application on the O and C land and another for a Section 15 lease, even though the acreage might be on adjoining or intermingled tracts.

The revised regulations provide for an allowance of forage for wildlife. The signing officer is also given the authority to specify the number of livestock to be grazed and grazing seasons on O and C lands—the same authority that is granted under Section 15 leases.

Clapp New Forestry Head at Mississippi State College

Professor Robert T. Clapp has been appointed head of the Department of Forestry at Mississippi State College, succeeding Professor Monty Payne, who resigned to take over the management of a farm in Winterville, Miss. Clapp has been at Mississippi State for 4½ years, first as associate professor and then professor. This period has been one of rapid expansion in

ROBERT T. CLAPP

the forestry work at the college, and Clapp was instrumental in setting up most of the new courses which are offered. He had charge of the two forestry camps in which students majoring in the new Agricultural Forestry curriculum are given 4 months of practical forestry instruction in the woods.

In his new position Professor Clapp will be in charge of all forestry teaching at the college and of forest research in the Mississippi Agricultural Experiment Station. He plans to continue the course set by Monty Payne with emphasis on farm forestry. The Agricultural Forestry degree course will be expanded and strengthened, but the pre-professional forestry course will also be continued. Research on the management of farm woodlands and on the processing and marketing of farm forest products will be continued.

Born in Cambridge, Massachusetts, in 1908, Mr. Clapp was graduated from the University of Pennslyvania in 1929, and received the Master of Forestry degree from Yale University in 1933. After a short period of work with the U. S. Forest Service he returned to Yale as instructor in forestry, where he remained for 10 years, becoming assistant professor of forestry and director of Yale Forests.

Logging, Sawmilling Show

Plans for a logging and sawmilling equipment show to be held at the Purdue-Moses Fell Annex Farm near Bedford on Oct. 25 and 26 have been announced by Prof. Roy C. Brundage of the Purdue University department of forestry.

The event, first of it kind in Indiana, will be sponsored by the Central States Forest Experiment Station, Bedford Chamber of Commerce, Indiana state division of forestry, Wayne-Hoosier National Forest, Indiana Hardwood Lumbermen's Association, U. S. Soil Conservation Service, and Purdue. Farm and industrial equipment manufacturers will cooperate in the show.

It will include demonstrations of felling, skidding, and loading equipment for use in farm woods and other small holdings. The sawing of logs in different types of sawmills will also be shown, and sawing and chopping contests are planned.

Prizes for homemade equipment ideas applicable to the harvesting and handling of farm timber will be awarded. Exhibits showing good woods practices, fire protection and safety, and the use of the mechanical tree planters will be featured.

AFPI Publishes New Forestry Bibliographies

Educators in search of up-to-date teaching materials on America's forest resources will find them listed in two new forestry bibliographies published by American Forest Products Industries of Washington, D. C.

One of these, a 16-page booklet listing available booklets, posters, charts, filmstrips, and motion pictures dealing with forestry, is being distributed to county and city school superintendents in all 48 states.

AFPI's second bibliography lists the teaching aids provided by individual forest industries and industry associations as well as by state forestry departments. More than 25,000 copies of this free booklet will be distributed.

Carl J. Stahl (1877-1950)

Carl J. Stahl, Denver, Colo., former associate regional forester of the Rocky Mountain Region of the Forest Service, died September 6.

Mr. Stahl retired from the Forest Service in December 1943, following 38 years of service. He started his career in 1905 as a forest guard on the Gunnison National Forest at the ghost mining town of Tin Cup; then followed in rapid succession service as ranger on the Cochetopa and San Isabel National Forests. He was the first supervisor of the Arapaho forest at Hot Sulphur Springs after its establishment by proclamation of President Theodore Roosevelt, July 1, 1908.

He was transferred to Denver upon the establishment of the regional office, December 1, 1908, serving as chief of the Division of Lands and Operation, and from 1935 to 1943 as associate regional forester. He was active in developing the present regional organization and in working out changes in boundaries and in the classification of lands included within the national forests as they were originally proclaimed.

Mr. Stahl was born in De Kalb County, Illinois, in 1877. After graduating from business college, he came to Colorado and engaged in ranching prior to his entrance into the Forest Service.

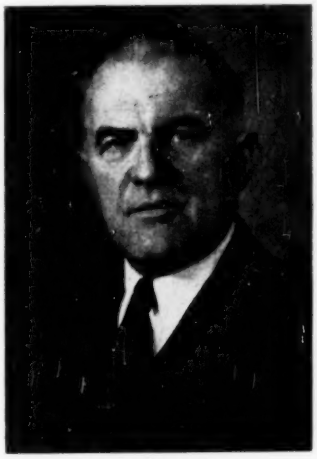
25 Million-Foot Timber Sale Reported on Eastern Forest

Sale of 25 million board feet of timber stumpage near the Maine-New Hampshire line in the White Mountain National Forest has been announced by Regional Forester William S. Swingler. The sale is one of the largest ever made on an eastern national forest and will consist of marked pulpwood, millwood, veneer and sawlogs.

The successful purchaser was the Nadeau Lumber Company, of Berlin, N. H. The Forest Service plans to keep ahead of the operating company in marking the trees to be cut and will have four million feet marked by the end of the current calendar year. The sale can run for 10 years, but the purchaser expects to finish it much sooner. The terms on which the timber was sold provide for periodic renegotiation of price during the operation, in line with current market quotations.

J. A. Cope (1887-1950)

Joshua Alban Copé of Ithaca, N. Y., extension forester of New York State, died suddenly from a heart attack on August 26. He would have been 63 years of age in December.



JOSHUA ALBAN COPE

Mr. Cope was born at Hatboro, Pa., on December 31, 1887. Upon graduation from Haverford College in 1912, he entered the Yale School of Forestry and received the M. F. degree in 1914.

During the next two years he was a forest assistant in the U. S. Forest Service in the Northern Rockies. Appointed instructor in forestry in charge of school forests at Westtown, Pa., in 1916, he served there until 1918 when he went with the Maryland State Board of Forestry as assistant to the state forester.

In October 1925 he was appointed extension forester at Cornell, a position which he held for nearly twenty-five years. He was one of the best known extension foresters in the country for he was a voluminous writer and travelled widely both in the United States and abroad.

A study he made in 1942 under a fellowship grant from the Charles Lathrop Pack Forestry Foundation resulted in the publication *Farm Forestry in the United States*. A frequent contributor to the JOURNAL OF FORESTRY, he also wrote many popular articles on forestry as well as technical bulletins.

Among the latter were *Christmas Tree Farming*, Cornell extension bulletin 704, published in 1946; *Care and Culture of Farm Woodlots*, Cornell extension bulletin 716, published in 1947; and *Know Your Trees*, written in collaboration with Fred E. Winch, Cornell 4-H Club bulletin 85, published in 1948.

It was a pleasure to be in Josh Cope's company in the woods. He was a good forester, a keen observer, a virile personality, a thorough individualist, and a credit to the forestry profession. He will be greatly missed.

National Forests Receipts Reach All-Time High

Receipts from national forests during fiscal year 1950 reached an all-time high of $33,594,614, an increase of 8 percent over the $31,075,321 taken in during fiscal year 1949.

Approximately 87 percent of the total receipts was derived from the sale of timber. Revenue from timber sales totaled $2..,379,217 as compared with $26,926,449 for the previous year. Region 6, situated principally in Washington and Oregon, led all other regions with a total of $13,390,100 in collections from timber sales.

Region 8, which comprises the 11 southern states south of Virginia showed a marked gain in timber receipts with collections of $6,949,698 as compared with $5,538,553 for the preceding year. Timber receipts in Region 3, Arizona and New Mexico, also gained considerably with $1,146,467 reported for fiscal year 1950 as compared with $856,336 for fiscal year 1949.

Only two of the 10 Forest Service regions reported a drop in total revenue. In comparison with fiscal year 1949, Region 5, situated principally in California, showed a decline of $637,220 and Region 2, comprised of Colorado, Nebraska, and parts of Wyoming and South Dakota, had a drop of $19,430.

Grazing receipts, which ranked second in importance to the sale of timber, totaled $3,385,004 for the year. This was a slight increase over the $3,275,964 collected during fiscal year 1949 for the grazing of cattle, horses, sheep, goats, and swine on national forests.

Revenue from summer cabin sites, recreational developments, oil drilling, mining, pastures, and other land uses brought in $750,927. The rental of water power rights on national forests netted $79,467.

South Dakota Launches Keep Green Program

A campaign to make all South Dakota residents forest fire prevention minded is now underway throughout the state. More than 300 South Dakotans—ranchers, businessmen, foresters, and educators—gathered in Rapid City's municipal auditorium August 18 to hear Governor George Mickelson officially launch Keep South Dakota Green.

Sponsored by the state Junior Chamber of Commerce, Keep South Dakota Green will encourage public participation in forest fire prevention work. South Dakota is the twenty-eighth state in the nation to launch a Keep Green program.

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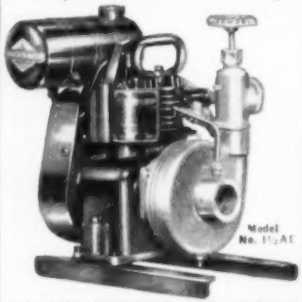

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Research Aid to Philippines

The U. S. Department of Agriculture has assigned Dr. Donald De Leon, forest entomologist, to the Philippines where he will assist Philippine scientists in their efforts to isolate and control insects believed responsible for contaminating coconut trees with a costly disease known as cadangcadang, thought to be caused by a virus.

Dr. De Leon's assignment is made at the request of the Philippine government. He is the third agricultural specialist to go to the Philippines during recent months in connection with the U. S. government's program of technical cooperation with other countries on problems of mutual concern. Dr. Otto A. Reinking, former Cornell University plant pathologist, has been assisting in disease control of abaca (Manila hemp) and coconuts since April. John V. Hepler, extension specialist of the Office of Foreign Agricultural Relations, went to the Philippines in February to give advisory aid in the setting up of a coordinated agricultural extension service.

Dr. De Leon, joined the Department of Agriculture as an entomologist in 1925. He assisted in the discovery that a leaf hopper is responsible for spreading the virus disease, phloem necrosis, that is causing widespread dying of elm trees.

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Roy B. Thomson (1904-1950)

Dr. Roy Bertrand Thomson, professor of forest economics at Duke University, died at Duke Hospital, July 27, after an illness lasting several months.

Dr. Thomson was widely known for his work in forest economics.

A native of Excelsior, Minn., he received the B.S. degree from the University of Minnesota in 1925; Master of Forestry degree from the Yale University School of Forestry in 1928, and Ph.D. degree from the Yale Graduate School in 1939.

He served with the Minnesota Forest Service from 1925-27 and during the next two years was patrolman and assistant forester in charge of land classification and public relations. He worked as junior forester on timber sales in Shasta National Forest in California from 1929-30. From 1930-34 he was assistant forest economist for the Forest Taxation Inquiry in New Haven, Conn.

Dr. Thomson served on the Iowa State College faculty from 1934-38 as associate professor of forest economics. He joined the Duke faculty in 1938 as an associate professor and became a full professor in 1947.

While at Duke, he was a consultant to the Pulpwood Investigating Committee of the South Carolina General Assembly and a technical analyst for the committee during its investigation of pulpwood procurement practices.

He served as lieutenant-commander in the U. S. Navy stationed in Memphis, Tenn., and San Juan, Puerto Rico, from 1942-45.

Dr. Thomson was preparing two publications at the time of his death: one, a book, co-authored with R. C. Hall, *Economics of American Forestry* and a report of a research project on the use of land in Durham County, N. C.

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Association Council Meets

The Council of State Forestry Association Executives held its second annual meeting at Hotel Wawbeek, Melvin Village, N. H. on the shores of Lake Winnipesaukie, September 10, 11, and 12.

The group discussed organizational problems of state forestry associations, methods of financing, and functions of such associations. In addition to representatives of state forestry groups from Texas, Louisiana, North Carolina, Virginia, West Virginia, Ohio, Connecticut, Massachusetts, New Hampshire, and Colorado were those of the Society of American Foresters, American Forest Products Industries, Inc., American Forestry Association, and American Bankers Association. W. C. McAdam of Champion-International Paper Company spoke to the group about industrial forestry in New England.

William Laybourne, executive secretary, Ohio Forestry Association was elected chairman of the group for 1950-51.

Future Farmers Reward Forestry Work

Six Future Farmers, who have won top honors in the Cooperative FFA Forestry Program—one each from: Virginia, North Carolina, South Carolina, Georgia, Florida, and Alabama—will receive all-expense trips to their national conclave to be held at the Municipal Auditorium, Kansas City, Mo., on October 9 to 12, according to Robert N. Hoskins, industrial forester, Seaboard Air Line Railroad Company. This marks the first time in the 23-year-old history of the FFA that forestry winners will attend.

Those boys who will win trips are: Carleton Smelley, Carson, Va.; Evan Plyler, Wesley Chapel, N. C.; Marion Rauton, Johnston, S. C.; Rooney Tillman, Surrency, Ga.; Franklin Roberts, Sopchoppy, Fla.; and John E. Golden, Pell City, Ala.

The total project accomplishments of the six winners are: plowed more than 10 miles of fire lines; thinned 36 acres from which they harvested 61 cords of pulpwood, 16 cords of fuel wood, and 645 fence posts; gum farmed 6,500 faces; made improvement cuttings on 28 acres from which they cut 24,500 board feet of lumber for home consumption. These young farmers planted 19,400 seedlings.

Prior to 1950 state and district forestry winners were given all-expense trips and scholarships to an out-of-state forestry training camp. Hoskins stated that the program was revised to place more emphasis on rural leadership and participation in the national meeting is a step in the right direction. District winners received cash awards and are eligible to compete for top honors next year.

Aids for Computing Tree Volumes

Aids for computing tree volumes for forest inventories are now available for Illinois and adjacent states. A technical paper just published by the Central States Forest Experiment Station gives correction factors for various tree species in Illinois so that farm foresters and others can compute tree volumes more accurately than heretofore.

Form classes for Illinois trees are now available for use with the generalized form class volume tables. Tree bark ratios for converting rough wood volumes to a peeled wood basis, bark thickness factors for determining form class of standing trees, and cubic volumes for pole-sized trees are presented.

The paper is the result of a study conducted in cooperation with the Illinois Technical Foresters Association. Copies of *Aids for Computing Tree Volumes in Illinois*, can be obtained from the State Forester, Springfield, the Forestry Department of the University of Illinois at Urbana, or the Central States Forest Experiment Station, Columbus, Ohio.

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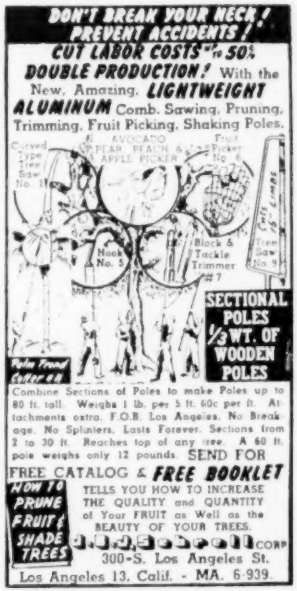
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Gluing Course at New York State College of Forestry

An intensive 3-day course in wood adhesives and gluing techniques will be given Nov. 15, 16, 17 by the New York State College of Forestry at Syracuse. Enrollment will be limited to 10 men from the woodworking industry.

Subjects to be covered include preparation of stock; cold press, hot press, and electronic gluing techniques; testing; and the characteristics of synthetic resins, starch, soybean, and animal adhesives. Students will use and test the glues in the woodworking shops.

Men having particular problems will be invited to discuss them with specialists on the staff. Problems need not be limited to gluing but may cover preservatives, lumber seasoning, stain and decay, warping, etc., according to James M. Owens, the College of Forestry's liaison with industry.

Alfred H. Bishop, associate professor of forest utilization, and Mr. Owens will head the faculty of four. Tuition will be $15.00. Details and registration forms may be obtained from Department of Public Education and Information, College of Forestry, Syracuse 10, N. Y.

Alfred Gaskill (1861-1950)

Alfred Gaskill, 89, died September 6, 1950 at his home in Brandon, Vt. Elected a Member of the Society of American Foresters in 1902, Mr. Gaskill had received his forestry training at the Biltmore Forest School, Harvard University, and the University of Munich.

In June 1899, he was appointed to the old U. S. Bureau of Forestry where he studied red fir in western Washington and the coast redwood in California. He also made a nationwide study of forest fire records which resulted in 1902 in a bulletin, *Forest Fires in the United States*. Following field work in the East, he prepared another early publication, *Extent and Character of the Hardwood Lumber Industry in the Southern Alleghenies*.

Appointed state forester of New Jersey in 1907, Mr. Gaskill served in that capacity, and later as director of the New Jersey Department of Conservation and Development until his retirement in 1922. He initiated New Jersey's state forest system, reforestation programs, and forest fire protection organization.

Action Against Grazing Trespassers Stepped Up

Actions against trespassers within grazing districts administered by the Bureau of Land Management, Department of the Interior, have been increased during the past year as precautionary measures against overgrazing the land, according to Marion Clawson, director of the bureau. He pointed out that failure to prevent trespass on the public land operates against the legal users who have paid fees for use of the resources. Actions to determine proper grazing and to control trespass are discussed in advance with the district advisory boards.

Reports from five western regions of the bureau for the fiscal year 1950 show that formal action has been taken on a total of 105 grazing trespass cases. Collections amounting to more than $14,000 resulting from these actions were placed in the U. S. Treasury.

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Arizona Range Society Meets in December

The Arizona section of the American Society of Range Management will meet at the University of Arizona on December 15 and 16. Dr. R. R. Humphrey, chairman of the local section, has appointed George Glendening, U. S. Forest Service; Matt Baird, operator of the Ruby Star Ranch; and A. L. Brown, assistant range ecologist at the University of Arizona, to outline the two-day program. Problems to be discussed include noxious plant control, reseeding, methods of rangeland appraisal, range forage plants, and range condition. A day of discussions and conferences will be followed by an all-day field trip to view range problems and improvements in southeastern Arizona.

Members of the Range Society are looking forward to the winter meeting as a follow-up to the interesting and educational meeting at Flagstaff on June 13 and 14.

Position Available

The *Hattiesburg American*, six-day afternoon newspaper in Hattiesburg, Mississippi invites applications from graduate foresters, who are natives of the Southeastern United States for a new forestry position the *American* is adding to its news department. The *American* intends employing a graduate forester who writes good forestry feature stories, either takes forestry pictures or can learn photography and who will serve as a consulting forester to farmers and landowners in South Mississippi. The *American* will pay a good salary and will furnish transportation to the right man who must have fact vision, intelligence, and ambition. Give full details and send recent photo.

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Littleleaf Study Involves Soil Problems

Thirty million acres of shortleaf and loblolly pine in seven southern states may yet be released from the grip of the mysterious littleleaf disease, according to U. S. Department of Agriculture forest pathologists. While they have not determined the actual cause of the disease, they find that lack of fertility, and of the soil-improving effect of sufficient humus material, are contributory factors that may prove to be vital.

Dr. George H. Hepting of the Bureau of Plant Industry, Soils, and Agricultural Engineering and George M. Jemison, of the Forest Service estimate that in 1950 littleleaf will kill $5,000,000 worth of pulpwood and sawtimber, mostly shortleaf pine. It is considered the worst forest plague to hit this region since blight killed the entire chestnut stand.

There are many possible causes of littleleaf disease, but the most likely one is a nitrogen deficiency that shows up when the feeder roots of the trees are damaged by a fungus, *Phytophthora cinnamomi*, which develops best in soils with compact, poorly-drained subsoil.

As a long-time hope, there is the possibility of developing resistant strains of shortleaf or loblolly. Resistant specimens have been found in areas of heavy infestation of the disease. But for the present, soil rehabilitation seems to offer the best solution. Much of the area was once in hardwoods. The pines return to the soil less than one-tenth as much calcium as the leaves of hickory, dogwood, and yellow poplar.

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MacAloney Directs Forest Insect Survey

Dr. Harvey J. MacAloney has been selected to have immediate supervision over the forest insect survey, Bureau of Entomology and Plant Quarantine. This is a new activity on the part of the bureau, and is provided for under the forest Pest Control Act, approved by Congress in 1947.

The survey is carried on from headquarters at the Agricultural Research Center, Beltsville, Md., and at eight field stations located in important forest regions: Fort Collins, Colo.; Berkeley, Calif.; Coeur d'Alene, Idaho; Portland, Ore.; Ogden, Utah; Milwaukee, Wis.; New Haven, Conn.; and Asheville, N. C. It involves close cooperation between the bureau and other federal and state agencies as well as with private timberland owners in coordinating the work of the various agencies in their efforts to detect potentially dangerous infestations of forest insects in the early stages.

Dr. MacAloney received the B.S. degree in 1923, the M.S. degree in 1925, and the Ph.D. degree in 1929, all from the New York State College of Forestry, where he specialized in forest entomology and related subjects. He has been employed by the U. S. Department of Agriculture in forest insect research and survey work since 1925. Since 1944, he has headed the forest management phases of research work on the spruce budworm and has served as leader on insect survey work in New England.

Positions Wanted

Graduate forester, 28, Utah State Agricultural College, B.S., 1949. Two and a half years experience with U.S. Forest Service, forest management, timber sales, fire control, plantation work, desires permanent position with forestry-minded company. Reference and details upon request.

Box M, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, 26, desires public relations job in forestry. B.S.F. University of Idaho 1948. M.F. University of Michigan 1950. Two years public relations experience. Detailed information upon request.

Box L, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate forester, 28, experience with U. S. Forest Service and tree service company, desires permanent position with private forest enterprise or wood products company. References and details on request.

Box K, Journal of Forestry, Mills Building, Washington 6, D. C.

Schwartz Appointed Canadian Laboratory Head

Dr. H. Schwartz has been appointed superintendent of the Forest Products Laboratory at Ottawa, Canada. The forest products laboratories at Ottawa and Vancouver (R. M. Brown, superintendent) form part of the Forest Products Division of the Canadian Department of Resources and Development.

The division, staffed by scientists and technicians in all aspects of wood utilization, conducts both pure and applied research into the properties and uses of Canadian woods and in technical and industrial problems connected therewith.

Dr. Schwartz had been head of the wood chemistry section of the Ottawa laboratory since 1941. He has been directing research on the chemistry of wood and bark and on the chemical utilization of wood waste.

Erle Kauffman Leaves AFA Editorship for Private Work

After twenty-three years with the American Forestry Association, Erle Kauffman, editor of *American Forests*, resigned effective September 1 to return to the field of private professional writing. Mr. Kauffman came to the American Forestry Association in 1927 as assistant editor, and since 1944 has been editor of the association's publications.

In addition to serving as editor, Mr. Kauffman has written more than fifty signed articles for the association's magazine and numerous stories for other publications. He is the author of two books: *Trees of Washington, the Man and the City;* and *Kingdom of the Trees.* The Trail Riders of the Wilderness program was conceived and launched by him in 1933 as a means of acquainting the American public with the beauty of the nation's wilderness areas and with first-hand knowledge of conservation problems and progress.

Forest Products Place in Emergency Program Being Defined

Following action by President Truman under the National Defense Act, a Defense Production Authority has been established in the Department of Commerce. The department's Forest Products Division, H. E. Holman chief, has been transferred to the new agency and is given authority for industrial controls in the forest products field.

Mr. Holman will be advised by eleven industry advisory committees; five for the production of forest products, and six in the distribution functions.

Under the President's delegation of authority, the U. S. Forest Service has the responsibility of certifying applications for federal loans for forest products plant expansions, an activity which will be assigned to the various regional offices of the Service.

The Forest Products Office in the National Security Resources Board, under M. N. Niewenhous, will continue to serve the President directly as liaison in planning and in coordinating the activities of the various agencies involved in forest products.

1949 Forest Fire Report

Forest land under organized protection against fire reached an all-time high of 569,169,000 acres in the United States during 1949. In the same year the nation's forest fire losses were held to 15,395,740 acres, lowest in history.

These two facts, and their obvious relationship to each other, are stressed in a recent national forest fire report published by American Forest Products Industries, Inc.

Today 30 states provide organized protection for all forestlands within their borders. Fifty-four percent of last year's forest fires occurred on the 81,874,000 acres of unprotected land. They accounted for 83 percent of the country's timber acreage loss.

The percentage of acreage loss from fire on unprotected land was .33 times greater than on timberland under organized protection.

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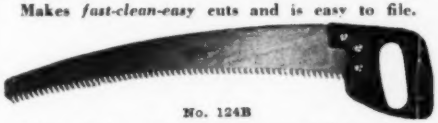

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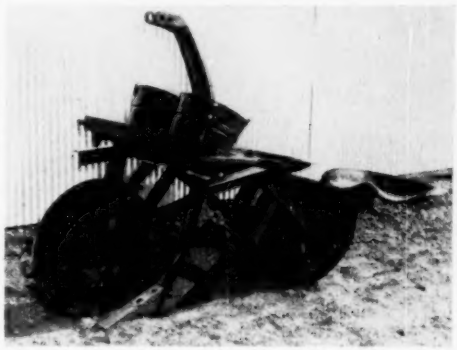

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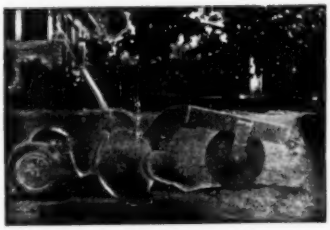

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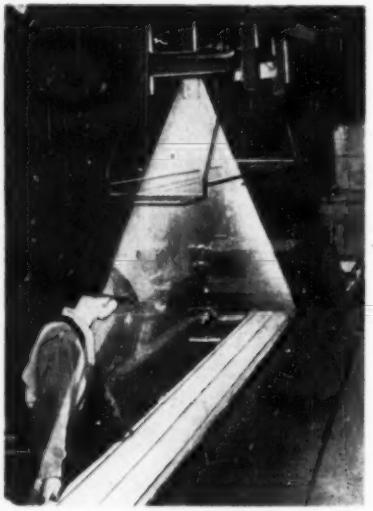

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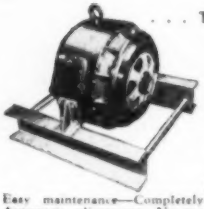

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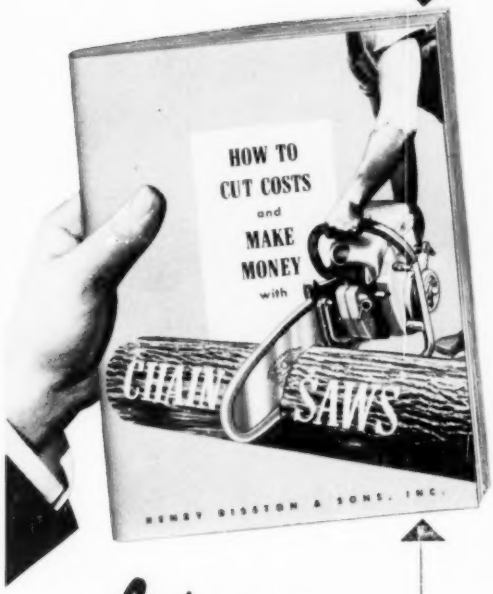

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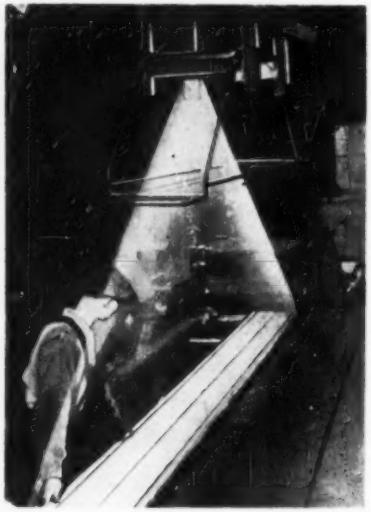

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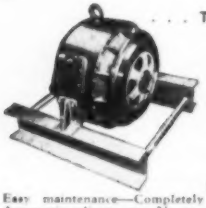

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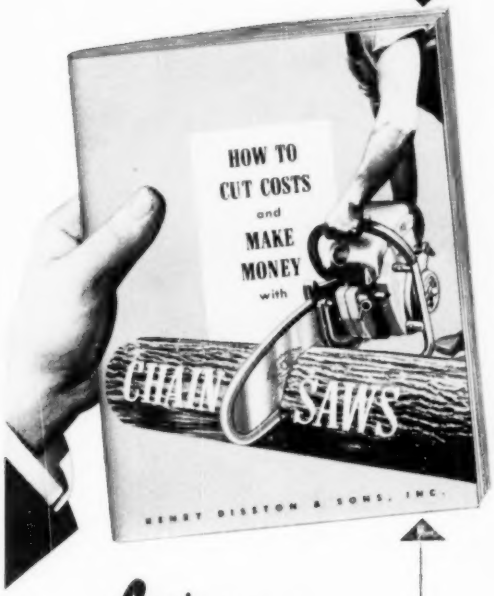

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